

# CORRECTIVE MEASURES STUDY DUPONT EAST CHICAGO EAST CHICAGO, INDIANA

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Project No.: 7587  
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CORPORATE REMEDIATION GROUP

*An Alliance between  
DuPont and URS Diamond*

Barley Mill Plaza, Building 19  
Wilmington, Delaware 19805

US EPA RECORDS CENTER REGION 5



1003362



DuPont Corporate Remediation Group  
Barley Mill Plaza - Bldg. 19  
4417 Lancaster Pike  
Wilmington, DE 19805

October 30, 2006

Mr. Brian P. Freeman  
U.S. EPA, Region V  
Waste Pesticide and Toxics Division  
Enforcement and Compliance Assurance Branch  
77 West Jackson Boulevard, DRE-9J  
Chicago, Illinois 60604-3590

**DuPont East Chicago Corrective Measures Study (CMS)**

Dear Mr. Freeman:

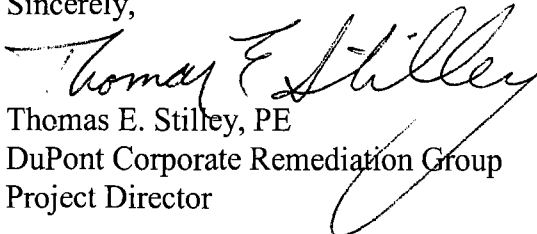
Please find attached, three copies of the DuPont East Chicago CMS. As you will see, the CMS recommends the following:

- ☐ Installation of a Permeable Reactive Barrier (PRB) along a portion of the Grand Calumet River.
- ☐ Construction of engineered covers over 12 solid waste management units (SWMUs) and areas of concern (AOCs) to address human health concerns.
- ☐ Investigation of groundwater along the north-east property line to determine sources and assess potential downgradient receptors.
- ☐ Refined ecological risk assessment to advance the understanding beyond the screening-level assessment conducted to date.

Upon your approval of the CMS, a detailed pre-design investigation will be undertaken to field test various PRB materials, gather geotechnical data, and model various design scenarios. In addition, surficial delineation will be conducted at SWMUs and AOCs subject to engineered cover to achieve optimal benefit.

We would be happy to meet with you at the site or at your office to discuss the CMS if you feel it necessary. If you have any questions, please call me at 302-892-7601 or Alan Egler at 302-892-1296.

Sincerely,

  
Thomas E. Stilley, PE  
DuPont Corporate Remediation Group  
Project Director

cc: Chris Meyers, IDEM  
File Copy

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## EXECUTIVE SUMMARY

In accordance with the Hazardous and Solid Waste Amendments (HSWA) portion of the Resource Conservation and Recovery Act (RCRA), E.I. DuPont de Nemours and Company (DuPont) submits this Corrective Measures Study (CMS) for solid waste management units (SWMUs) 1A, 1J, 3, 4, 7, 10B, 10D, 14; areas of concern (AOCs) 2E, 6, 12, and 13; and groundwater Pools A and B located at the DuPont East Chicago site in East Chicago, Indiana. This CMS identifies and evaluates potential remedial alternatives for portions of the East Chicago site to ensure protection of human health. Additional evaluations of potential ecological risks will be addressed separately.

Groundwater on site is addressed in this CMS due to potential off site migration. Groundwater on the northern side of the site is not used for consumption or process-related activities, thus contact is limited to potential contact with basement sump water in Riley Park, a residential area north of the site. Migration north toward Riley Park is already addressed by an existing permeable reactive barrier (PRB) that is treating site-related constituents. Groundwater flowing to the south discharges to the Grand Calumet River (the River); therefore, this CMS will address discharge with a proposed PRB.

Soils on the site are generally covered with vegetation and access to them is restricted by fencing, security guards and other administrative controls. However, there are some selected locations where constituent concentrations in surface soils significantly exceed their respective screening levels. An evaluation was undertaken to identify remedial levels that would result in no unacceptable short term risk as a result of exposure to these soils. Areas where soil concentrations exceed short term remedial levels were identified for remedial action to address soils.

Six remedial alternatives were identified in the CMS that could address potential human contact with surface soils and migration of site-related constituents in groundwater. Based on the threshold and balancing criteria, Alternative 2, a surface cover for selected soil areas and a PRB along the southern site boundary with institutional controls is recommended. This alternative is recommended for the following reasons:

- ☐ Institutional, administrative, and engineering controls will prevent direct contact with impacted soils and ground water
- ☐ Installation of a new PRB will address the potential migration of Pool B groundwater into the Grand Calumet River and will help mitigate the groundwater to surface water path way.
- ☐ Re-development in the future is likely to include features such as asphalt parking lots, paving, and sidewalks—all of which would effectively mitigate human and ecological contact with the underlying soil. Placement of cover as a component of Alternative #2 provides beneficial site preparation activities for future re-development. In addition, this alternative can be easily upgraded to something more protective, if required, during site re-development.
- ☐ This alternative includes development of a refined ecological risk assessment. The potential ecological risk is currently based on comparison to very

conservative and generic screening levels. Therefore, a more site-specific ecological risk assessment will be performed in addition to implementing the proposed corrective measures. Based on the results of the refined ecological risk assessment, any additional remedial measure(s) required to address ecological risks will then be implemented as part of subsequent corrective measures.

## 1.0 INTRODUCTION

The purpose of this CMS is to identify and evaluate potential remedial alternatives for portions of the East Chicago site that require remedial decisions based upon previous studies. In accordance with the 1996 Advanced Notice of Proposed Rule Making (ANPR) (USEPA, 1996), this CMS considers the available data and site-specific information to focus on the most feasible alternatives to protect human health via direct contact and impact to groundwater exposure pathways.

In accordance with the Hazardous and Solid Waste Amendments (HSWA) portion of the Resource Conservation and Recovery Act (RCRA), E.I. DuPont de Nemours and Company (DuPont) hereby submits this corrective measures study (CMS) for solid waste management units (SWMUs) 1A, 1J, 3, 4, 7, 10B, 10D, 14, areas of concern (AOCs) 2E, 6, 12, and 13, and groundwater Pools A and B located at the DuPont East Chicago site in East Chicago, Indiana.

Areas were selected for inclusion in this CMS based upon the results of the Phase I and II RCRA Facility Investigation (RFI). Table 1-1 presents a summary of the RFI findings for each of the SWMUs or AOCs under consideration on the site. In the RFI Phase I and II, SWMUs or AOCs where concentrations of site related constituents in soils posed potentially unacceptable risks were recommended for inclusion in the CMS. For this CMS, prior to evaluation of remedial alternative, a refined estimation of potential risks was performed to incorporate data collected after the completion of the RFI and to assess realistic current and future land use exposure scenarios. Areas where no potentially unacceptable risks were identified under the refined scenario, the SWMU or AOC was not included in the remedial alternatives discussed in this CMS.

This CMS does not address SWMUs and AOCs that contribute to potentially unacceptable ecological risk. The assumptions used to develop the draft baseline ecological risk assessment (BERA) were based on standardized exposure scenarios and values that are potentially inconsistent with site-specific conditions at the East Chicago site (DuPont, 2006). Therefore, a more refined ecological risk assessment will be performed during the corrective action based on site-specific and species-specific factors. Based on the results of the site-specific ecological risk assessment, remedial alternatives for AOCs and SWMUs that are associated with only ecological risks will be submitted to the U.S. Environmental Protection Agency (USEPA) in a subsequent CMS or in another report format, if required. However, it should be noted that submission of a subsequent CMS is not mandatory if a performance-based approach is used for the corrective action to mitigate the ecological risk pathway [61 Federal Register (FR) 19432, Section III.C.4.b – Formal Evaluation Not Always Necessary].

## **2.0 BACKGROUND**

The following sections provide a brief summary of the background of the DuPont East Chicago site. Information contained in these sections is summarized from the Current Conditions Report (CCR) (CH2MHill, 1997), the Phase I RCRA Facility Investigation (RFI) Report (DuPont, 2002), and the Environmental Indicator (EI) Determination Report (CA750) (DuPont, 2005).

### **2.1 Site Location and Setting**

The DuPont East Chicago site is located at 5215 Kennedy Avenue, East Chicago, in Lake County, Indiana (see Figure 2.1). The site is bounded on the north by the Riley Park residential area and various commercial properties, the south by the East Branch of the Grand Calumet River, the east by commercial properties (including the City of East Chicago Solid Waste Transfer Station), and the west by Kennedy Avenue and the former USS Lead Refinery.

In 1892, the Grasselli Corporation constructed an inorganic chemical manufacturing facility at this site. Development occurred primarily within the western part of the property. The southern part of this developed area was used mainly for manufacturing purposes and is sometimes referred to as the active manufacturing area (see Figure 2.2). The northwest quadrant of the developed area and the eastern edge of the developed area were used for waste management purposes. The easternmost portion of the site, referred to as the natural area, is not developed.

### **2.2 Manufacturing and Production History**

#### **2.2.1 Manufacturing History**

The Grasselli Corporation began manufacturing at the East Chicago facility in 1893. DuPont operated the facility for Grasselli from 1927 through 1936. Grasselli formally deeded the entire property to DuPont on October 31, 1936, and the facility has since been owned and operated by DuPont. Operations peaked around 1945 and began to decline after World War II. Between 1950 and 1970, the facility employed 700 workers. In 1990, it employed 52 workers to manufacture two products – sodium silicate and colloidal silica. Manufacturing operations, including support activities, now cover 28 acres in the southwest corner of the site. The work force consisted of about 40 employees in early 2000 when the business was sold to W.R. Grace Company.

#### **2.2.2 Production History**

Over its 105-year lifetime, the DuPont East Chicago facility produced more than 100 products, primarily inorganic acids and chemicals; various chloride, ammonia, and zinc products; and inorganic agricultural chemicals. Organic chemical manufacturing began in 1948, after more than 50 years of plant operation, and ended in 1986. Organic

chemical manufacturing consisted primarily of trichlorofluoromethane (TCFM) or Freon<sup>®</sup> products. Freon<sup>®</sup> production by DuPont was initiated at the federal government's request. In addition, several organic herbicides and insecticides were also manufactured.

## 2.3 Site Current and Future Land Use

Currently, the majority of the site remains fenced and unused. With the exception of a 28-acre area in the southwestern corner of the site, the plant has been decommissioned and demolished, leaving only foundations and roadways in place. This area was referred to as the "previously active manufacturing area" in the RFI and is part of the "Commercial/ Industrial Re-development Area" landuse under the current conditions presented on Figure 2.3. This CMS focuses on conditions within or attributable to the previously active manufacturing area. Active manufacturing continues in the southwestern corner of the site. The facility now manufactures a colloidal silica product (Ludox<sup>®</sup>) and a sodium silicate solution. These products are used in x-ray film; photographic paper; pigments; nonslip coatings; low phosphate detergents; and metal castings for aerospace, medical, and recreational products. A more detailed summary of the various raw materials, products, and waste streams at each manufacturing area is contained in Volume 2 of the CCR (CH2MHill, 1997).

A six foot high fence topped with razor wire surrounds the main operating area of the site, including the previously active manufacturing area. The fence and property perimeter are patrolled routinely to control trespassing and monitor the condition of the fence.

Future on-site land use is anticipated to be similar to current uses in that manufacturing operations will continue and use of the property will remain non-residential. Figure 2.3 details planned future land use for the site. As shown in the figure, the site has been divided in the following five areas:

- ☐ Active manufacturing area
- ☐ Commercial and industrial re-development area
- ☐ Natural area
- ☐ Natural area buffer zone
- ☐ Deed restricted area [permitted landfill, permeable reactive barrier (PRB) areas]

Within the deed restricted area, little or no development will be allowed in three locations (landfill and PRBs) due to the presence of subsurface components and buried wastes. Likewise, a deed restriction will be placed sitewide, prohibiting the use of shallow groundwater. As previously stated, this CMS addresses conditions within the re-development area.

## 2.4 Geology

### 2.4.1 Regional Geology

The DuPont East Chicago site lies within the Calumet Lacustrine Plain. The surficial geologic deposits in this area are dune and beach complex deposits formed during and after the last glacial age when Lake Michigan water levels were significantly higher than present levels. Beach ridges and dunes are characterized by fine to medium sands that are intermittently coarse or pebbly and rich in natural organic matter. This unit, known as the Calumet Sand, is up to 65 feet thick (Watson, et al., 1989).

The Calumet Sand was deposited on an irregular surface eroded into glacial till and/or lacustrine clay. The till consists of a stiff, gray, silty clay matrix with pebbles and rock fragments. There are discontinuous sand and gravel layers within the till. The Calumet sand/till contact slopes toward Lake Michigan at approximately 0.0013 feet/foot. Together, the thickness of the till and Calumet Sand is approximately 100 to 160 feet. The till lies directly upon the bedrock near the plant site.

Beneath the Calumet Sand and the till lies a sequence of about 4,400 feet of sedimentary rocks (Rosenshein and Hunn, 1968). They are, from youngest to oldest, a Middle Silurian Dolomite, an Upper Ordovician shale, a Middle Ordovician sandstone, a Lower Ordovician and Upper Cambrian dolomite and sandstone, and an Upper Cambrian sandstone, shale, and dolomite.

Regional dune and beach complex deposits in the area surrounding the site are characterized by low-lying dune and swale sequences. Industrial and residential development of the dune and swale sequence required fill to raise the surface elevation above from the groundwater/surface water interface. Historical fill materials derived from a steel mill and other heavy industrial sources were used to raise the surface elevation both at the site and in neighboring Riley Park (Kay, et. al. 1997).

### 2.4.2 Site Geology

The DuPont East Chicago site consists of fill and uniform unconsolidated beach sand (the Calumet Sand) overlying clay till. Areas where manufacturing activities previously occurred are characterized by fill and debris overlying the natural dune and swale sequence. Due to the undulating nature of the dunes and swales, fill depth is reported as ranging from 12 feet to none at all. In most locations in the developed portion of the site, fill depths range from 2 to 6 feet (DuPont, 2002). Natural peat, silt, and sand have been reported below the fill. The base of the sand (the sand/till contact) is encountered at an approximate depth of 27 to 42 feet below ground surface (bgs). During the Phase II RFI, cross sections were developed for the site. Soil borings installed at the site have established the uniformity of the sand in the Calumet Sand deposits at the site.

Site bedrock stratigraphy is documented in a geologic log for a deep test well that was installed (and later abandoned) in 1915 by the Grasselli Corporation. Site-specific stratigraphy is consistent with regionally reported stratigraphy, with the Calumet Sand

present to a depth of 40 feet bgs (directly underlain by a clay till) and Silurian dolomite bedrock encountered at 150 feet bgs.

## 2.5 Hydrogeology

### 2.5.1 Regional Hydrogeology

Where saturated, the Calumet Sand is known as the Calumet Aquifer. Regionally, the saturated thickness of the Calumet Aquifer ranges from 0 to 70 feet, the porosity from 0.3 to 0.4, the transmissivity from 670 to 4,000 square feet per day (ft<sup>2</sup>/day), and the hydraulic conductivity from 1 to 180 feet/day (Rosenshein, 1961; Rosenshein and Hunn, 1968; Harke, et al., 1975; Watson, et al., 1989; Fenelon and Watson, 1993; Greeman, 1995; Kay, et al., 1996). The primary inflow to the Calumet Aquifer is recharged by precipitation infiltration. Annual recharge from precipitation has been estimated at 5 to 13 inches/year (Watson, et al., 1989; Fenelon and Watson, 1993; Greeman, 1995).

The hydraulic conductivity of the clay till underlying the Calumet Aquifer is estimated to range from 0.0004 to 0.06 feet/day (Rosenshein, 1961; Fenelon and Watson, 1993; Kay et al., 1996). Under the vertical gradients observed in the region, the till acts as a confining unit separating the Calumet Aquifer above from the bedrock aquifer below.

The United States Geological Survey (USGS) measured water levels at a network of 96 groundwater and surface water sites in Northern Lake County in northwest Indiana (Greeman, 1995). Five of the wells installed and monitored by the USGS as part of the regional studies are located on the East Chicago site. Potentiometric surface maps have been developed using USGS potentiometric data. The data indicate that groundwater flow discharges to area surface water bodies (Lake Michigan, Grand Calumet System) or is captured by area sewers, drains, or other dewatering systems. Regional potentiometric surface water maps are contained in the Environmental Indicator Determination Report (CA750) (DuPont, 2005b).

### 2.5.2 Site Hydrogeology

Groundwater is encountered at the site approximately 0 to 10 feet bgs in the fill or Calumet Sand underlying the facility. The aquifer material consists of sand and, in some instances, fill or peat overlying the sand. The base of the sand is about 35 to 40 feet bgs. The sand lies upon a relatively flat impermeable clay till.

Groundwater flows away from an east-west trending groundwater divide that runs through the developed part of the site. The groundwater system underlying the site has been subdivided into pools that are identified as Pool A (located north of the groundwater divide) and Pool B (located south of the groundwater divide). On the south side of the divide (Pool B), groundwater flows south and discharges to the Grand Calumet River. On the north side of the divide (Pool A), groundwater flows to the north toward Riley Park, a salvage yard, and trucking operations. The potentiometric surface map and the associated groundwater divide are provided in Figure 2.4.

Water level data north of the site showed the presence of a local groundwater depression in Riley Park (see Figure 2-9 in CH2MHill, 1997). The groundwater depression at Riley Park is caused by the infiltration of groundwater into sewers and basement sumps. Based on hydrologic studies performed in the area by Greeman (1995), Kay, et al. (1996, 2002), and others, the groundwater depression associated with the Riley Park sewers captures and currently controls groundwater that is migrating northward from the East Chicago site.

## **2.6 Surface Water and Topography**

### **2.6.1 Regional Surface Water**

The Grand Calumet System (which comprises the East Branch, West Branch, and Indiana Harbor Canal) is the predominant surface water feature within the region. In the early 1800s, the smaller natural river (referred to as the Grand Calumet River) flowed to the east, discharging to Lake Michigan in Gary. In the early 1900s, the Indiana Harbor Canal was dug between Lake Michigan and the river to provide a shipping canal for local industry (see Figure 2.1 for location of canal). These modifications reversed the flow in the East Branch so that water in the original channel now flows to the west. Construction of the Indiana Harbor Canal and connection (in the West Branch) to the Illinois River Basin Sag System resulted in capture of water that would have drained east to Lake Michigan. Streamflow in the eastern part (the East Branch) of the Grand Calumet System was significantly decreased. The reduced flow, combined with the sand dune migrations, resulted in the closure of the river's original outlet at Lake Michigan (about 10 miles east of the East Chicago site).

Shortly after the East Branch outlet was closed, this waterway's characteristics were dramatically altered. The channel became the primary conveyance system for effluent discharges from the industries and municipalities in the region. The maximum river flow in the East Branch occurred when the effluent discharges from industries along the waterway were at the highest levels (from the mid-1940s through the mid-1970s).

Today, flow from the East Branch joins flow from the West Branch just west of the East Chicago site, at the southern end of the Indiana Harbor Canal. The canal conveys the combined flow north-northeast to Lake Michigan. The rate of flow to the lake is controlled primarily by industrial discharges and the relative elevation of surface water in the channel and lake (Fenelon and Watson, 1993).

### **2.6.2 Site Topography**

Topography in the developed part of site has been altered by filling and regrading. Soil, steel mill slag, sinters, and other fill materials were used to create a secure site foundation within the primary manufacturing area. Site relief varies from 584.5 to 590.5 feet above mean sea level, sloping gently (0.003 to 0.006 feet/feet) toward the south-southwest. There is a regional high of 600 feet ( $\pm 5$  feet) in a ridge at the center of the northern half of the site. The distinctive dune and swale topography in the eastern undeveloped part of

the site reflects original beach ridges and swales created by former Lake Michigan shoreline processes (see Figure 2.5 for a site topographic map).

### 3.0 SUMMARY OF PREVIOUS INVESTIGATIONS

Four investigations formed the basis for this CMS; these include the 1997 *Current Conditions Report*, the 2002 *Phase I RFI*, the 2005 *EI Determination Report* (CA 750) and the 2005 *Phase II RFI*. Recommendations for remedial actions are based on the results of the Phase II RFI, the CA750, and on a revised assessment of potential risks under current exposure scenarios that is included in this section of the CMS. Section 3 presents a summary of findings from these investigations in order to provide the necessary background for identification of constituents and areas that require further consideration in this CMS.

#### 3.1 Human Health Baseline Risk Assessment

This section of the CMS summarizes the conclusions presented in an appendix of the Phase II RFI titled Draft Human Health Baseline Risk Assessment (HH BLRA) for DuPont East Chicago (DuPont, 2005a) and a revised assessment of potential risks to onsite receptors as a result of realistic current and future use of the site. The HH BLRA was requested by the USEPA Region V in a letter to DuPont dated May 22, 2003. This assessment was submitted to the USEPA in July 2004 as a companion document to the *Phase II RFI Report*. A revised assessment was submitted on January 31, 2005, in response to comments received from the Agency in a letter to DuPont dated July 28, 2004, and a conference call between USEPA and DuPont on November 17, 2004. The HH BLRA was approved by USEPA on December 9, 2004. The revised assessment of human health risk presented in this section incorporates additional data that were not available when the HHBLRA was prepared and revised exposure scenarios that reflect realistic usage of the site.

##### 3.1.1 Summary of 2005 HH BLRA Results

The HH BLRA evaluated the potential exposure of human receptors to constituents detected in soil and groundwater at SWMUs and AOCs. The objectives of the HH BLRA were to: (1) determine whether releases from SWMUs and AOCs pose unacceptable risks to human health and the environment, and (2) provide information to support decisions concerning further evaluation or remedial action under current and reasonably anticipated future land use.

The risk assessment evaluated potential risk from exposure to groundwater on a sitewide basis according to flow dynamics (Pool A and Pool B), including discharge into the East Branch of the Grand Calumet System. Potential risk from exposure to soil was evaluated at individual SWMUs and AOCs and from combined exposure at multiple units within the following larger exposure areas:

- ☐ Exposure Area 1 – Active Manufacturing Area (25 acres)
- ☐ Exposure Area 2 – Commercial/Industrial Re-Development Area (167 acres) and Deed Restricted Area (48 acres)

Due to the large size of the Commercial/Industrial Re-Development Area and Deed Restricted Areas Exposure Areas, the area was further subdivided into three smaller areas: Previous Manufacturing Area, North Waste Management Area (WMA) and South WMA; these areas are presented on Figure 2.2.

Both current and future land use were considered in the HH BLRA, but because land use is expected to remain the same, no difference was assumed in the exposure for current or future receptors. Potential receptors included on-site industrial workers, construction/excavation workers and trespassers, and on-site restoration workers in the Natural Area. In addition, off-site Riley Park residents exposed to groundwater released to basement sumps were evaluated. Exposure via ingestion, inhalation and dermal contact was evaluated in all exposure scenarios. USEPA's risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  and a hazard index (HI) of 1 was used as decision points for identifying units of potential concern.

The results of the HHBLRA risk assessment are summarized below:

☐ Groundwater

- Shallow groundwater is not used on-site for potable or industrial uses, and residential users have not been identified in Riley Park. However, shallow groundwater may be contacted during intrusive activities, expressed as seeps near the on-site landfill or off-site in Riley Park basement sump water. No unacceptable health risks were identified in the assessment.
- Groundwater discharging to surface water (East Branch of the Grand Calumet System) was not identified as an exposure pathway of concern. Maximum detected groundwater concentrations did not exceed surface water screening criteria [Indiana Ambient Water Quality Standards (IAWQS)] when a modeling-derived, conservative, site-specific dilution factor accounting for groundwater and surface water interaction was applied. The surface water quality criteria used in the evaluation was based on the protection of human health (nondrinking water and fish consumption).

☐ Soil

- No unacceptable health risks were identified for soil in Exposure Area 1 (Active Manufacturing Area).
- Potentially unacceptable health risks were identified for soil in Exposure Area 2 (Commercial/Industrial Re-Development Area and Deed Restricted Areas). Under both current and future land use conditions, the receptor identified with the greatest potential for exposure was the on-site construction/excavation worker, who has a greater likelihood of exposure via direct contact with impacted surface and subsurface soil associated with intrusive activities. There are no current on-site industrial worker exposures to the area. With the exception of the following units in the area under the reasonable maximum exposure (RME) conditions, no significant risks were identified for on-site trespassers and on-site restoration workers: SWMUs 1A, 1C, 1I, 1J, 3, 4, 7, 10A, 10D, 12A and 21, and AOCs 2E and 13. These SWMUs and AOCs were recommended for remedy evaluation in the CMS to

further reduce the potential for exposure to constituents of potential concern (COPCs) based on the current conservative risk evaluation.

- COPCs identified at these units located within Exposure Area 2 included antimony, arsenic, cadmium, iron, lead, manganese and zinc. Corrosivity issues were also identified as a potential concern at four units (SWMUs 3, 4, 10A, and 21). However, direct contact (via ingestion and dermal contact) was the risk driver at most of these units.

### 3.1.2 Update of 2005 HH BLRA Risk Characterization

Data collected in 2006 to support the Baseline Ecological Risk Assessment (BERA) was also used to update the risk estimates previously presented in the 2005 HH BLRA. In January 2006, 44 surface soil samples (0 to 2 ft bgs) from SWMUs 2D, 10B, 10C and 14, and from AOCs 1C, 1F, 2A, 2C, 2D, 3A, 3H, 3E, 5, 6 and 12 were collected as part of the BERA. In addition, 24 surface soil samples from six surficial runoff points within the Natural Area Buffer Zone were collected as part of the BERA to supplement existing data and fill data gaps. Depending on the units, samples were analyzed for site-specific metals, target analyte list (TAL) metals, volatile organic compounds (VOCs) or pH. In addition to updating risk estimates to incorporate these data, risks were estimated for the restoration worker active in the Natural Area. Runoff samples RNOF-01, 02, 04 and 05 are included both with individual SWMUs and AOCs (SWMUs 10C and 14 and AOC 12) they were closest to, and with the Buffer Zone data set. Figure 3.1 presents the SWMUs and AOCs that were included in this reanalysis of potential risk on-site.

Exposure scenarios used to perform this assessment were the same as the final HH BLRA (DuPont, 2005a).

#### Soil Risk Characterization

As shown in the tables in Appendix A, constituents of potential concern (COPCs) were identified at SWMUs 2D, 10B, 10C, and 14 and AOCs 6 and 12. Corrosivity issues (pH less than 3) were not identified at any of the units.

Updated risk estimates for the six units are presented in Appendix B and summarized by unit in Tables 3.1 and 3.2. As shown in the table, RME cancer risk estimates and noncancer HIs for on-site industrial workers and on-site construction workers exceeded USEPA acceptable risk levels at SWMUs 10B and 14. RME cancer risk estimates and noncancer HIs for on-site construction workers exceeded USEPA acceptable risk levels at AOCs 6 and 12. Total HIs ranged from 2 to 20. Cancer risk estimates ranged from  $7 \times 10^{-6}$  to  $2 \times 10^{-4}$ . RME cancer risk estimates and noncancer HIs for on-site trespassers were within acceptable risk levels. (HIs by target organ were less than 1; estimated cancer risks were between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$ ). Cumulative central tendency (CT) cancer risk estimates and noncancer HIs for on-site industrial workers, on-site construction workers, and on-site trespassers were within acceptable risk levels.

During the HH BLRA, analytical data were not available to directly evaluate the potential significance of restoration worker exposure to potentially impacted surface soil within the Natural Area. As a result, analytical data from SWMUs and AOCs located directly adjacent to the Natural Area, such as SWMU 10D, were previously used to assess

potential risk. Subsequently, surface soil data collected during the January 2006 investigation from the Natural Area Buffer Zone were used to re-evaluate potential risks for the on-site restoration worker. As shown in Appendix C, RME cancer risk estimates and noncancer HIs were within acceptable risk levels. Appendix D contains exposure point concentration calculations for the data set.

### Evaluation of Lead

Lead lacks a reference dose because the pharmacokinetics of lead differs from other constituents. Thus, lead has been assessed using the USEPA uptake model. Table 3.3 shows the average concentrations of lead in surface and subsurface soil at the SWMUs and AOCs where lead was identified as a COPC. Average concentrations of lead in surface soil from surficial runoff points within the Natural Area Buffer Zone are also shown in the table. As shown in the table, three units (SWMU 10B and AOCs 6 and 12) and Natural Area Buffer Zone samples contained average concentrations of lead above both the industrial worker/trespasser screening level of 1,300 mg/kg and above the upper end of the range of construction/excavation worker screening levels (4,166 mg/kg). The highest lead concentration of 147,000 mg/kg was observed at SWMU 10B. The unit has an established vegetative cover.

### 3.1.3 Refinement of HH BLRA under Current and Near Future Land Use Conditions

The HH BLRA was performed primarily using conservative default exposure assumptions, thus the results provided a worst-case estimate of risk. To provide a more realistic evaluation in light of the anticipated plans for site reuse, a more site-specific risk evaluation was performed as part of this CMS to guide potential site remedy. The site-specific evaluation detailed in this section includes a re-evaluation of exposure assumptions under current and future land uses for the following potentially complete exposure pathways evaluated in the HH BLRA. This assessment will be revisited after re-development planning is complete to ensure the protectiveness of the remedial measures.

- ☐ On-Site Industrial Worker – Incidental ingestion of and dermal contact with surface soil and inhalation of soil-derived particulates and vapors
- ☐ On-Site Construction/Excavation Worker – Incidental ingestion of and dermal contact with soil (surface and subsurface) and inhalation of soil-derived particulates and vapors
- ☐ On-Site Restoration Worker – Incidental ingestion of and dermal contact with surface soil and inhalation of soil-derived particulates and vapors within the Natural Area
- ☐ On-Site Trespasser – Incidental ingestion of and dermal contact with surface soil and inhalation of soil-derived particulates and vapors

### On-Site Industrial Workers

There is no current on-site industrial worker exposure in the Commercial/Industrial Re-Development Area and Deed Restricted Areas Exposure Areas and re-development of the

area is not planned in the near future. As a result, on-site industrial workers were not considered to be potential receptors in the evaluation.

### **On-Site Construction/Excavation Workers**

The RME exposure assumptions presented in the HH BLRA considered a construction/excavation scenario with an upper-end exposure duration of 250 days/year. However, construction/excavation work in the near future would be limited to personnel involved in PRB wall installation. Based on experience with previous PRB wall installation at the site, construction is expected to take approximately 30 to 60 days. As a result, exposure assumptions presented in the HH BLRA for the central tendency (CT) scenario (45 days/year for one year) are the most relevant for providing information for risk management. The CT exposure scenario would also be considered protective of excavation/utility workers, because utility repair work typically takes less than a week.

As shown in Table 3.2, cumulative CT cancer risk estimates and noncancer HIs for on-site construction/excavation workers calculated in the HH BLRA exceeded USEPA cumulative risk levels of  $1 \times 10^{-4}$  and a total HI of 1 by target organ. Total HIs ranged from 6 to 20. Cumulative CT cancer risk estimates ranged from  $1 \times 10^{-5}$  to  $1 \times 10^{-4}$ . Risk estimates in Exposure Area 2 were driven by five units located within the Previous Manufacturing Area (SWMU 4 and AOC 2E), North WMA (SWMUs 1J and 7) and South WMA (SWMU 10D). Total HIs at the five units ranged from 3 to 10, with a maximum total HI by target organ of 7. Individual constituents' CT cancer risk estimates at the units were below or within acceptable risk levels, ranging from  $5 \times 10^{-7}$  to  $7 \times 10^{-5}$ .

Table 3.4 details the average concentrations of lead in surface and subsurface soil at SWMUs and AOCs evaluated in the risk assessment. Mean concentrations of lead were utilized in the risk assessment. The use of the mean for lead evaluations is consistent with recommendations presented in the Adult Lead Model (ALM) (USEPA, 2003a), which was calibrated using central tendency exposure assumptions. As shown in the table, the following ten areas contained average concentrations of lead above the upper end of the range of site-specific construction/excavation worker screening levels (4,166 mg/kg): SWMUs 1A, 1I, 1J, 4, 7, 10B, and 10D and AOCs 6, 12, and 13.

With regard to the on-site construction/excavation worker, DuPont has established worker safety procedures that include health and safety plans and excavation permitting program in place at the site, which would continue in the future, to ensure that appropriate measures are taken for personnel protection should such subsurface activity encounter impacted soils.

### **On-Site Restoration Workers**

As detailed in the HH BLRA, site-specific information (e.g., exposure frequency and duration) were assumed in the development of both RME and CT exposure assumptions for the on-site restoration worker (DuPont, 2005a). As shown in Appendix C of the CMS, cancer risk estimates and noncancer HIs were within acceptable risk levels.

Table 3.3 details the average concentrations of lead in surface soil in the Natural Area Buffer Zone. Consistent with the HH BLRA, the IDEM default industrial direct contact soil screening level of 1,300 mg/kg was used to evaluate worker exposure. This level is

consistent with levels calculated using the ALM along with site-specific exposure assumptions. As shown in the table, the average lead concentration in the Buffer Zone samples (7,559 mg/kg) was above the industrial worker screening level of 1,300 mg/kg. In the data set, the highest lead concentration (124,000 mg/kg) was observed at AOC 12/runoff location RNOF-05. If this the sample location was removed from the Natural Area Buffer Zone data set, then the average concentration of lead (807 mg/kg) would be less than the screening level.

Similar to the on-site construction/excavation worker, the proper and prudent use of protective measures as required by OSHA regulations [e.g., personal protective equipment (PPE)] would limit exposure for the on-site restoration worker.

### On-Site Trespassers

The RME exposure assumptions presented in the HH BLRA considered a youth trespasser scenario with an upper-end exposure duration of 45 days/year. However, the current security fence effectively prohibits entry to the site. Specifically, a 6 foot high fence topped with razor wire surrounds the Active Manufacturing Area of the site, including Commercial/Industrial Re-Development Area and Deed Restricted Exposure Areas. In addition, the fence and property perimeter are patrolled routinely to control trespassing and monitor the fence condition.

Consequently, exposure assumptions presented in the HH BLRA for the CT scenario are the most relevant for providing information for risk management (five days per year for 10 years). As shown in Table 3.2, cumulative CT cancer risk estimates and noncancer HIs were within acceptable risk levels. (HIs by target organ were 1 or less; estimated cancer risks were within  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$ .)

As detailed in the HH BLRA, the IDEM default industrial direct contact soil screening level of 1,300 mg/kg was used to evaluate both industrial worker and trespasser exposures to lead in soil (DuPont, 2005a). The screening level was considered to be protective of trespasser exposure to the areas being evaluated in the HH BLRA, such as the previously active manufacturing area. As shown in Table 3.4, 13 units within Commercial/Industrial Re-Development Area and Deed Restricted Exposure Areas contained average concentrations of lead above the trespasser screening level of 1,300 mg/kg. However, as concluded in the HH BLRA, overall exposure for on-site trespassers to lead in surface soil was considered insignificant for the CT scenario due to the following:

- ☐ The limited event frequency (five events per year) would allow the clearance of lead from the blood between each event.
- ☐ Those units where lead in surface soil exceeds screening criteria consists of less than 10% of the potential surface area for exposure (within active operating areas).
- ☐ The potential for direct contact is further limited due to the presence of a ground cover (construction debris, concrete slab, or moderate vegetative cover) over a majority of these units.

### Summary of Refined HH BLRA

The Refined HH BLRA identified soil conditions that exceeded USEPA cumulative risk levels of  $1 \times 10^{-4}$  and a total HI of 1 by target organ for the following CT scenario: SWMUs 1J, 4, 10D, and AOC 2E. However, as detailed above, mitigating factors are in place that minimize the potential for direct contact and control worker exposure for potentially complete soil exposure pathways at the site. Thus, Table 3.1 presents extremely conservative estimates of actual risks and hazards posed by conditions on site.

#### 3.1.4 Units Identified for Evaluation Based on Potential for Acute Risk

Landuse and Administrative controls are in place to control worker exposure to soils at the site. However, there are some selected locations where COPC concentrations in surface soils significantly exceed their respective screening levels. As such, remedial levels were developed to address potential acute exposures to COPCs identified in the HH BLRA: antimony, arsenic, cadmium, iron, lead, manganese and zinc.

Acute remedial level calculations are presented in Table 3.4. The following assumptions were utilized in the calculation:

- ☐ Assumes one time exposure event for a youth trespasser.
- ☐ Although a youth trespasser might also be exposed by soil/skin contact and by inhalation of airborne dust from soil, the magnitude of the soil ingestion exposure far outweighs those other exposures. Therefore, for the acute remedial level calculation, only the soil ingestion exposure event was quantified.
- ☐ USEPA recommended values, consistent with those detailed in Table 13 of the HH BLRA, were utilized for soil ingestion rate and body weight (DuPont, 2005A).
- ☐ Because the remedial level is based on a single exposure event, terms related to averaging time and exposure frequency were deleted.
- ☐ A bioavailability value of 100% was assumed.

Where available, reference doses appropriate for acute exposure (less than 14 days duration) were used in the calculation. Sources of acute toxicity values are noted in the table. As shown, an acute toxicity value for antimony was derived for the calculation. The toxicity value was based on a lowest observed adverse effects level (LOAEL) observed in humans as cited by the Agency for Toxic Substances and Disease Registry (ATSDR) *Toxicological Profile for Antimony and Compounds* and USEPA's Integrated Risk Information System (IRIS). The LOAEL was based upon an endpoint of gastrointestinal distress.

Table 3.6 details the derivation of an acute remedial level for lead. This remedial level was based on achieving a weighted average surface soil lead concentration of 400 mg/kg, assuming that a youth trespasser is exposed part of the year to soil at home (hypothetical) and part of the year to surface soil at the site. The derivation of the screening level is consistent with USEPA guidance regarding intermittent or variable exposures (*Assessing*

*Intermittent or Variable Exposures at Lead Sites*, USEPA, 2003b). The following assumptions were used in the derivation:

- ☐ The weighted surface soil lead level for exposure may not exceed 400 mg/kg (the USEPA default residential soil screening level which represents a 5% probability of exceeding a blood lead level (PbB) concentration of 10 micrograms per deciliter (ug/dl)).
- ☐ Exposure at the site occurs once per month during warm weather months (five days). Five months of exposure satisfies the minimum exposure duration to achieve a quasi-steady state PbB concentration (3 months) as recommended in the guidance document (USEPA, 2003b).
- ☐ Exposure to lead in soil at the residence occurs for the remainder of the exposure period.
- ☐ The lead concentration in soil at the residence (hypothetical) was assumed to be 200 mg/kg, the default soil/dust lead concentration used in USEPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model.

A comparison of acute remedial levels derived for COPCs at the site to maximum detected concentrations is detailed in Table 3.7. As shown in the table, maximum detected concentrations of three COPCs (arsenic, iron, and lead) exceed the acute remedial levels. Soil boring locations that exceed the levels are detailed in Tables 3.7A and 3.7B. Acute remedial levels were exceeded at the following units: SWMUs 1A, 1I, 1J, 3, 4, 7, 10B, 10D, 14, 21, and AOCs 2E, 6, 12, and 13.

Iron concentrations, with the exception of the three locations at SWMU 21, are co-located with locations which exceed acute remedial levels for arsenic and lead. Average concentrations at SWMU 21 (184,000 mg/kg) slightly exceed the acute remedial level of 135,000 mg/kg. The acute remedial level of iron is based on a level corresponding to the Recommended Daily Allowance (RDA). Even at soil concentrations slightly above the level corresponding to the RDA, iron intake from soil ingestion is insignificant relative to iron intake from dietary sources and mineral supplements. Therefore, soil iron levels are not generally expected to be of health concern (TNRCC, 2001).

### 3.2 Ecological Risk Assessment

DuPont may redevelop portions of the East Chicago site. Re-development was evaluated in the draft BERA report submitted to the USEPA (DuPont, 2006). As mentioned in Section 1.0, the assumptions used to develop the draft BERA was based on standardized exposure scenarios and values that may not be consistent with the re-development at this site. Until specific re-development activities are better defined, DuPont will focus on refining the understanding of ecological risk at individual SWMUs and AOCs that lie within areas subject to potential re-development. This refinement will involve additional data evaluation and may include a field effort to characterize localized ecological conditions. Once that understanding is achieved and the BERA report has been finalized,

a range of remedial options will be considered and discussed in a CMS for ecological risk.

### 3.3 Groundwater

Groundwater conditions have been investigated since 1989. This section presents a summary of the findings of previous investigations including the 1997 Current Conditions Report, the 2005 EI Determination Report (CA 750) and the 2005 RFI Phase II.

#### 3.3.1 Pool A Groundwater Flow

DuPont has defined Pool A groundwater as the groundwater on the north side of the groundwater divide. The groundwater on the north side of the divide exits the northern site boundary flowing in a northward direction. In general, once off-site, the groundwater associated with Pool A discharges into a groundwater sink created by the sewer system and residential sumps that underlie the neighboring Riley Park residential area (CH2MHill, 1997). From the sewer system, the groundwater travels to the City of East Chicago treatment system, where treated water is discharged to Lake Michigan.

Due to the presence of a PRB within the western portion of Pool A, Pool A groundwater has been divided into two sections: Pool A-West and Pool A-East.

##### Pool A-West

Based on a study by CH2MHill (1997), it was concluded that the groundwater associated with the western half of Pool A flows due north toward the Riley Park residential development (see Figure 2.4). This study determined that the sewer system and sumps underlying Riley Park act as a sink to capture groundwater from the East Chicago site. This conclusion is supported by several USGS reports that note the impact of leaky sewer systems on the Calumet aquifer (Cohen, et al., 2002; Kay, et al., 2002).

In order to evaluate potential contact with site-related constituents in groundwater, risk estimation was performed to assess potential contact with groundwater from sumps in Riley Park, downgradient from the site in Pool A. This risk estimation was based on an extremely conservative incidental ingestion of sump water scenario. Concentrations of constituents detected in sump water from basements in Riley Park resulted in carcinogenic risks that fall within USEPA's acceptable risk range and have a hazard index of less than one. Although the groundwater in Riley Park posed no unacceptable risk, a PRB was installed within this area of Pool A to treat the groundwater in the western half of Pool A prior to exiting the site. The location of the PRB is noted in Figure 5.1.

##### Pool A-East

The groundwater flow pattern associated with the eastern half of Pool A has been deduced based on multiple assessments of on-site groundwater by DuPont and by multiple assessments of groundwater in the East Chicago area by various organizations [Fenelon and Watson, 1993; Greeman, 1995; Kay, et al., 1996 and 2002; Watson, et. al., (1989); Willoughby and Siddeeq (2001); CH2MHill (1997)]. On-site groundwater in the

eastern half of Pool A (Pool A-East) also flows north toward the northern site boundary. North of the site, the groundwater flow direction shifts to the west where it is controlled by a groundwater sink created by subsurface sewer systems. Additional details pertaining to Pool A-East groundwater flow is provided in the Environmental Indicator Determination Report (CA750) (DuPont, 2005b).

### **Riley Park**

Groundwater flow within Riley Park is controlled by the groundwater sink discussed in the previous sections. Groundwater within Riley Park is recognized as being impacted by inorganics leaching from the fill that the community is built upon (CH2MHill, 1997). There is no use of groundwater in the residential area, nor is there any unacceptable risk posed by incidental contact with groundwater in basement sumps; thus, potential impacts associated with past site releases or fill in the community do not pose unacceptable risks to humans (DuPont, 2004).

### **3.3.2 Pool A and Riley Park Groundwater Analytical Data**

This section and associated subsections discuss groundwater analytical results associated with Pool A groundwater. For ease of discussion, data are presented for Pool A-West, Pool A-East, and Riley Park. In the RFI, dissolved groundwater data in Pool A were screened against drinking water maximum contaminant levels (MCLs) to assess potential unacceptable constituent concentrations. This section presents results in comparison with MCLs; however, because the unconfined aquifer does not represent a drinking water source, this assessment provides a conservative screen.

#### **Pool A-West**

Pool A-West groundwater conditions were evaluated using analytical data from 1997 through 2003 for the Pool A-West perimeter wells MW-11, MW-12, MW-21, MW-22, MW-23, MW-24, and MW-25. Arsenic and cadmium were detected in the dissolved fraction at concentrations greater than MCLs. The PRB was installed to treat these site-related constituents. During treatability studies, its effectiveness on arsenic and cadmium was established. Since treatability, the focus has been placed on arsenic concentrations because this constituent was the risk driver. Data indicate that the PRB is addressing these site-related conditions.

The arsenic concentrations associated with the western half of Pool A are being addressed by a PRB that was installed in 2002 and was designed specifically to treat arsenic contamination in groundwater. Analytical data immediately downgradient of the PRB indicate that arsenic is removed to below detection limits by the treatment system.

Both Riley Park and the site were constructed on fill material. Recent studies have identified this material as a potential source of constituents in soil and groundwater (Kay, et al., 1997). Arsenic concentrations in perimeter wells are currently greater than the Federal MCL and Indiana drinking water standard of 10 micrograms per liter ( $\mu\text{g/l}$ ). Data at the perimeter downgradient of the PRB indicate that arsenic concentrations are higher, but concentrations have been stable for the duration that data are available (1989-2006), than immediately downgradient of the treatment system. Gradual reduction of

arsenic levels at the perimeter is expected over time as the PRB-effects spread. Currently, any arsenic-impacted groundwater downgradient of the PRB is controlled by the Riley Park sewer system and residential sumps. The 2004 Riley Park residential sump sampling performed by DuPont and the USEPA determined that groundwater within the Riley Park residential sumps does not pose any unacceptable risk. Furthermore, concentrations were found to be similar to the 1990 Riley Park sampling event, indicating plume equilibrium. DuPont will continue to monitor groundwater quality near the PRB to ensure continued performance of the treatment system.

### **Pool A-East**

Groundwater analytical data from 1997 through 2004 for the Pool A-East perimeter wells (MW-02, MW-09, and MW-10) were assessed. This assessment determined that arsenic and antimony were the only constituents to exceed their respective MCL in the dissolved fraction (Appendix E presents Pool A analytical results). Based on the 1997 through 2004 data associated with perimeter wells MW-02, MW-09, and MW-10, DuPont concludes that the arsenic concentrations have stabilized and currently show only minor fluctuations in concentration.

Pool A-East groundwater constituents are currently being controlled by the groundwater depression created by the Riley Park basement sumps and the underlying city sewer system. The EI Determination Report (CA 750) provides additional details on this groundwater depression (DuPont, 2005). During the CMS process, additional sampling and analysis will be performed to evaluate aquifer conditions and identify the source of inorganics in Pool A-East groundwater. Like most of the region, the site was built on fill, which in itself, is a potential source of inorganics, including arsenic. If Pool A-East groundwater is determined to be affected by past production-related activities, then additional groundwater treatment or source control will be evaluated.

### **Pool A – Riley Park**

In 1990 and 2004, DuPont collected water samples from several Riley Park residential sumps. Significant changes were not observed between sump concentrations measured during these two sampling events. Arsenic, iron, sulfate, and zinc concentrations exceeded their respective MCLs. Possible sources of inorganics in groundwater include iron slag that was widely used as fill in the area and potential releases of site-related constituents in the northern portion of the site. Additional information pertaining to the Riley Park sump sampling and associated results is provided in the EI Determination Report (CA725) (DuPont, 2004).

### **3.3.3 Pool B Groundwater Flow**

Based on on-site groundwater measurements and various USGS studies, Pool B groundwater flows to the south toward the Grand Calumet River where it discharges (Kay et. al., 2002). A 2004 NRD settlement with nine industrial sources of sediment contamination in the Grand Calumet River stipulated that existing sources of constituents had to be controlled to prevent recontamination of the river once aquatic remedial measures were complete. Assessment of the groundwater transport pathway, performed in the Phase II RFI, indicated that there would be acceptable risks for potential

recreational use of the river, as a result of groundwater discharge to the Grand Calumet. However, in order to comply with the NRD settlement, additional evaluation of the potential for site groundwater to impact the surface water is included in this study.

### 3.3.4 Analytical Data

In order to select a conservative remedial alternative to address Pool B groundwater discharge into Grand Calumet River, groundwater constituent concentrations associated with Pool B were compared to water quality criteria to determine if potentially unacceptable concentrations existed in the groundwater. Previous modeling performed as a component of the RFI suggests that the river dilutes groundwater discharge from the site by up to 5,000 times. With this much dilution, groundwater would not contribute any unacceptable concentrations of site-related constituents to the river (DuPont, 2005a). For this study, a more conservative approach of applying a dilution factor of 100 was selected to assess remedial measures necessary to address the NRD settlement. This approach was taken recognizing that the future use of the river may, as a result of the remediation, include greater access to both human and ecological receptors.

A hierarchical approach was employed to select appropriate screening criteria. Screening criteria were based on the lower of Indiana Department of Environmental Management (IDEM) water quality standards (IWQS) for chronic protection of aquatic life and/or nonconsumption protection of human health. However, in one instance for mercury, the chronic protection of aquatic life WQS was selected instead of the lower nonconsumption human health value and wildlife protection value. The human health value is based upon fish consumption and direct contact which is extremely conservative based on a fish consumption advisory for the Grand Calumet. Likewise, there is extremely limited wildlife habitat in this area. Therefore, neither extensive human fish consumption nor wildlife water consumption is believed to occur in East Chicago. In addition, mercury is not believed to be a site-related constituent. If no value was available from the IDEM, federal chronic ambient water quality criteria (AWQC) were used to screen groundwater data. The selected surface water criteria were then multiplied by conservative dilution factor of 100 to account for dilution in the river, and the resultant adjusted screening criterion was used to identify groundwater areas with elevated metal concentrations.

Pool B groundwater analytical data from perimeter wells along the river were assessed as part of the EI Determination (CA750) (DuPont, 2005b). The perimeter wells were selected because they would be most representative of the groundwater flowing off-site. The analytical constituents monitored included a comprehensive list of organics and inorganics. Concentrations greater than appropriate surface water screening criteria were identified as representing potentially unacceptable releases to the river. For this CMS, all data available for Pool B perimeter wells were screened against adjusted screening criteria.

Groundwater from monitoring wells MW-13, MW-14, MW-28, MW-15, MW-3, MW-4, and MW-5 were evaluated to determine if site-related constituents could be discharging into the Grand Calumet River at concentrations that might approach the adjusted screening criteria. Previous hydrologic modeling has indicated that actual dilution into the river is several orders of magnitude greater than the conservative dilution factor

employed in this assessment. Thus, the exceedances presented here provide an extremely conservative estimate of potential contributions to the river. Iron was detected, either as a total or dissolved result, but not necessarily both at the same time, greater than the adjusted screening criteria in MW-04, MW-05, and MW-15. It is not known whether this constituent is related to past site activities or the fill material used to construct the site. Zinc was detected at concentrations greater than the adjusted screening criteria in MW-05 and MW-28. MW-03 has concentrations of arsenic that are greater than adjusted screening criteria. The lack of consistency between constituents in adjacent wells suggests that well defined contaminant plumes do not exist in groundwater at this site.

Based on information presented in the Phase II RFI, modeled surface water concentrations associated with these wells do not pose any unacceptable risk to humans or the environment. However, as a component of the NRD settlement for the Grand Calumet River, DuPont must prevent future contamination of the river as a result of groundwater discharges. The specific compliance criteria for this settlement have not yet been established; therefore, DuPont is proactively addressing groundwater while these specifics are being established.

### 3.4 Summary

#### 3.4.1 Soil

Data from SWMUs and AOCs were evaluated to determine where potentially unacceptable concentrations of site-related constituents may exist. This evaluation included a conservative HH BLRA that was presented in the Phase II RFI. The baseline risk assessment estimated risks for potential, current, and future exposure to site soils and groundwater; a summary of these results is presented in Table 3.1. Due to an improvement in the site perimeter fence, security presence, and uncertainty associated with specifics regarding future re-development, an additional human health risk evaluation was prepared for this CMS. The refined risk assessment addresses both revised risk calculations for the scenarios that were presented in the HH BLRA (DuPont, 2005) and a refined risk evaluation that is based on short-term exposure to site soils. The refined risk evaluation presented in this report bases its recommendations of actions on potentially acute effects associated with potential direct contact with soil. Based upon safeguards that DuPont has instituted for this site, the scenario used to derive these acute soil remedial levels is conservative and is not believed to be occurring on-site.

In the CMS, remedial action is recommended to address potentially acute soil conditions within areas of SWMUs or AOCs or entire SWMUs/AOCs, depending on the distribution of elevated arsenic or lead concentrations. The goal of this action is to mitigate the potential exposure pathway for surface soils in the isolated areas. In addition, remedial alternatives will be considered that reduce the potential for elevated surface soil constituent concentrations to migrate via water or wind erosion to uncontrolled areas off-site. Areas that have been selected for remedial action are presented in Figure 3.2. Elevated soil constituent concentrations at depths greater than two feet are not considered to pose a potentially unacceptable risk under the refined risk scenarios. Thus, this CMS includes no further consideration of soil at this depth.

### 3.4.2 Groundwater

Groundwater in Pool A flows to the north to the groundwater sink created by the Riley Park sewer system. Groundwater in this pool is not used for consumption either on-site or in adjacent Riley Park. However, potential direct contact with sump water derived from this pool could occur off-site. To address potential contributions of site-related constituents to off-site groundwater, DuPont installed a PRB in 2002. Additional evaluation of groundwater quality will be undertaken near the PRB to ensure continued performance of the system. However, human exposure to this groundwater is not occurring, thus there are no unacceptable risks posed by current conditions and the plume is currently stable and contained by the sewer system.

Groundwater in Pool B flows to the south and discharges to the Grand Calumet River. There is no use of groundwater from this pool either on- or off-site and modeling indicates the dilution in the Grand Calumet River is sufficient to prevent any exceedances of IWQS for site-related constituents under current conditions. Therefore, there is no unacceptable risk posed by site-related constituent concentrations in groundwater. However, DuPont is a signatory to a consent order that is associated with a NRD settlement for sediment contamination in the Grand Calumet River. As part of the settlement, DuPont has agreed to prevent future contributions of site-related constituents to the Grand Calumet River. As a result, the Phase II RFI recommended that a passive groundwater treatment system be installed along the southern site boundary to prevent reintroduction of site-related constituents to the river.

## 4.0 CORRECTIVE MEASURES

### 4.1 Remedial Action Objectives (RAOs)

Based on the results of the HH BLRA and the recommendations presented in the previous section the following RAOs are recommended for affected soil and groundwater at the site:

- ☐ Soil
  - Limit direct access to impacted soils by restricting access.
  - Limit direct access to elevated site-related COPCs through remedial measures to cover or remove affected soils.
- ☐ Groundwater
  - Limit direct access to impacted groundwater by restricting access
  - Mitigate off-site migration of constituents that represent a continuing release in groundwater.
  - Reduce migration of site-related COPCs via groundwater to surface water discharge points.
  - Reduce site-related constituents in groundwater at the fenceline to the extent practicable.

### 4.2 General Response Actions

The RAOs listed above can be achieved through a variety of approaches referred to as general response actions. These general response actions can be used alone or in various combinations to achieve the RAOs. Potentially applicable general response actions for soil and groundwater encompass a focused range of remedial technologies and processes and are as follows:

- ☐ Soil
  - Restrict access: institutional and engineering controls (fencing, deed restrictions, and signage)
  - Remedial action: prevention of soil contact through surface cover
  - Remedial action: stabilization or excavation and disposal
- ☐ Groundwater
  - Implement institutional controls (deed restrictions)
  - Reduce off-site migration of impacted groundwater
  - Treat impacted groundwater by monitored attenuation and PRB

## **5.0 DEVELOPMENT OF POTENTIAL REMEDIAL ALTERNATIVES**

This section identifies corrective measure alternatives applicable to each media and area of the site proposed for corrective measures. As per the 1996 ANPR, the CMS does not necessarily have to address all potential remedies (USEPA, 1996). Rather, the CMS can focus on those remedies that would be most appropriate considering site-specific factors. The following Section of the 61 FR 19432 (61 FR 19432, Section III.C.4 –Evaluation of Remedial Alternatives) provides guidance regarding the CMS process.

This CMS considers the available data and site-specific information to focus on the most feasible remedial alternatives. The following sections discuss remedial technologies that, in combination, could be suitable for the remedial alternatives.

### **5.1 Identification of Remedial Technologies for Soil**

#### **5.1.1 Institutional, Engineering and Administrative Controls**

Institutional controls are non-engineering instruments such as legal controls that minimize the potential for human exposure to COPCs by limiting land use. Institutional controls are generally used in conjunction with, rather than in lieu of, engineering measures such as waste treatment or containment. Some examples of institutional controls include easements, covenants, and site use restrictions. A deed restriction will be implemented to ensure that the site is used for only purposes compatible with future, post-remediation conditions

Engineering controls are physical features that minimize the potential for direct contact, such as a fence or soil cover, that separate the impacted soils from contact with humans or environmental receptors.

Administrative controls are already in place at the site and include industrial zoning, security guards, and intrusive activity permits. Intrusive activity permits are procedures to ensure that anyone conducting subsurface activities at the site in the future considers the appropriate health and safety protection. Currently, the site is surrounded by a fence and manned with security guards.

Institutional engineering and administrative controls are capable of attaining the remedial action objective of limiting human access to impacted soil. Because groundwater may contact impacted soil at SWMUs and AOCs, this alternative would not prevent or control the leaching of COPCs from soil to groundwater.

#### **5.1.2 Surface Cover**

A surface cover is capable of attaining the RAO of limiting human access to soil with elevated concentrations of constituents. In this alternative, a generic cover system would be installed over areas within AOCs or SWMUs that have constituent concentrations in

excess of acute remedial levels (see Section 3.1.4). Areas where existing foundations or pavement currently prevent contact with surface soils will not be further covered. The various possible covers include the following:

- ☐ Aggregate Cover: The erosion layer would consist of a 12 inch thick aggregate stone layer imported from off-site sources. This option would effectively mitigate the potential for direct contact with affected soils and provide long-term stabilization from potential wind or rain erosion.
- ☐ Vegetative Soil Cover: A low-maintenance vegetative cover could be established to stabilize the soil cover system and reduce erosion potential. This option would include a 12 inch thick layer of clean soil overlying areas with elevated concentrations and seeding to ensure soil stability.

The cover would extend a minimum 2 feet beyond the limits of the impacted soil within the area of the AOCs or SWMUs identified for remedial action. Surface cover activities are proposed only for areas identified as having potentially acute risks. In selecting the type of cover that would provide the best barrier for contact or erosion, the amount of maintenance required to successfully install the cover was evaluated and existing surface cover in the area surrounding the SWMU or AOC. An aggregate barrier would provide an immediate and long-term control for direct contact or wind or rain erosion of soils. This type of cover would require little, if any, long-term maintenance on this flat site. In addition, an aggregate cover would eliminate the potential for ecological use of potentially impacted areas so this alternative would also address ecological receptors' exposure with soil. Vegetated soil covers would only provide an adequate barrier if vegetation is successfully established on the cover. This type of cover would require maintenance to support establishing a complete vegetative cover and would require long-term maintenance to ensure that vegetation remains healthy and erosion is not diminishing cover effectiveness.

In addition, application of a surface cover alternative would require the following:

- ☐ Use of sediment and erosion controls during construction to prevent runoff (into the Grand Calumet River)
- ☐ Provisions to ensure the long-term maintenance of the soil cover
- ☐ Deed restrictions to ensure that anyone conducting subsurface activities at the site considers the appropriate health and safety protection

Because groundwater may contact impacted soil at SWMUs and AOCs, a cover by itself would not sufficiently prevent or control the leaching of COPCs from soil to groundwater. As a result, this alternative might need to be augmented with a groundwater control remedy.

### 5.1.3 Asphalt Cover

An asphalt cover is capable of attaining the RAO of limiting human access to impacted soil. This alternative involves capping AOCs and SWMUs using an asphalt cap to prevent human health exposure. Similar to a surface cover, placement will surround, but

not cover, existing impermeable areas. The various components of the asphalt cover system would be as follows (from bottom to top):

- ☐ Base Course: The base course would consist of an 8-inch graded aggregate layer.
- ☐ Binding Course: The binding course would consist of a 3-inch hot-mix bituminous concrete layer.
- ☐ Wearing Course: The wearing course would consist of a 2-inch bituminous concrete wearing layer in accordance with Indiana Department of Transportation (DOT) regulations.

This alternative would also require the following:

- ☐ Diligent use of sediment and erosion controls during construction to control runoff into the Grand Calumet River
- ☐ Provisions to ensure the long-term maintenance of the paved areas
- ☐ Deed restrictions to ensure that anyone conducting subsurface activities at the site considers the appropriate health and safety protection

This type of remedial measure can be easily incorporated into site re-development assuming that future use will include asphalt parking lots, paving, and sidewalks. Installation of an asphalt cover, paving, or sidewalks would prevent human contact with the underlying soil. Similar to an aggregate cover, this technology would also eliminate the potential for ecological contact with impacted soils.

Because groundwater may contact impacted soil at SWMUs and AOCs, an asphalt cover would reduce the amount of infiltration but would not sufficiently prevent or control the leaching of COPCs from impacted soil to groundwater. This alternative might need to be augmented with a groundwater control remedy such as a PRB.

#### **5.1.4 Excavation and Off-Site Disposal**

Excavation and off-site disposal would attain the RAO of limiting human access to the impacted soil within a relatively short time frame and would not require deed restrictions for site surface soils. This alternative would involve excavating impacted surface soil areas. The excavated soils would then be disposed of at an approved off-site disposal facility. The soils would be disposed of as either nonhazardous or hazardous waste based on the concentrations of the COPCs and in accordance with applicable local, state, and federal regulations. Use of this technology to eliminate potential human exposure to potentially acutely toxic concentrations of constituents would result in several large areas being excavated to 2 feet bgs. This soil would be transported through the residential area surrounding the site which could affect the acceptability of this alternative to the community. Although this alternative would provide a permanent and relatively quick solution to elevated concentrations of inorganics in soils, it would not treat the waste and could result in potential contact with humans in a different location as a result of a transportation accident. In addition, it is anticipated that the removal area would require fill to return it to the existing grade thus increasing the volume of heavy truck traffic in the surrounding community more than other remedial technologies.

Because groundwater may contact impacted soil at SWMUs and AOCs, excavation and off-site disposal would not sufficiently prevent or control COPC leaching from soil to groundwater. This alternative might need to be augmented with a groundwater control remedy such as a PRB.

### 5.1.5 In Situ Stabilization

In situ stabilization is capable of attaining the RAO of limiting human access to impacted soil. This alternative involves mixing the soil with a cement-based or another additive to encapsulate the COPCs in a solid matrix. In this alternative, the impacted soils (down to a depth of 2 feet) would be incorporated into the rigid concrete-like matrix, causing the COPCs to be less bioavailable and less mobile. Most in situ stabilization techniques are highly influenced by site-specific criteria; hence, this alternative would require bench-scale testing to select the appropriate reagent and design the mix proportion. In addition, pilot-scale studies would be required to establish viable techniques for developing an effective in situ delivery system to add and mix the needed levels of reagents to the soil. In situ stabilization would also require deed restrictions to ensure that future subsurface activities incorporate appropriate health and safety protection. In addition, this alternative could limit future site re-development because restrictions on disturbing stabilized material could prevent certain building types and configurations.

The long-term effectiveness of in-situ stabilization is unknown. Stabilized soils may potentially degrade once again, since solidified and stabilized wastes are naturally vulnerable to the same physical and chemical degradation and weathering processes as soil or concrete. When the stabilized soil is exposed to varying environmental conditions such as freeze-thaw cycles and acid attack, loss of structural integrity and decomposition of the stabilized mass can occur. Consequently, this loss of integrity and decomposition could result in potential exposure of humans and ecological receptors to constituents in unconsolidated surface media.

Because stabilization is focused on addressing the potential for direct contact with surface soils, this alternative would not address potential soil migration to groundwater considerations. Thus, this alternative might need to be augmented with a groundwater control remedy.

## 5.2 Identification of Remedial Technologies for Groundwater

### 5.2.1 Monitoring and Institutional Controls

Use of monitoring and institutional controls would meet the RAO of reducing site-related constituents in Pool A groundwater at the fenceline to the extent practicable. This alternative is augmented by the existing PRB that reduces off-site migration of Pool A groundwater. This alternative involves the following:

- ☐ Monitoring groundwater
- ☐ Monitoring groundwater COPC migration in the shallow aquifer
- ☐ Implementing institutional controls to prevent contact with groundwater

Currently, groundwater is not used on-site or in the surrounding area for drinking water. This alternative would involve implementing institutional controls, such as deed restrictions, to prevent the installation of on-site drinking water supply wells in the future. In addition, monitoring would be required to assess attenuation processes of constituents in groundwater.

Groundwater from Pool B discharges to the East Branch of the Grand Calumet River. Therefore, this alternative would not meet the RAO of preventing site-related COPC migration via groundwater to surface water discharge points at concentrations greater than site-specific calculated groundwater cleanup levels. However, based on groundwater modeling results presented in the Phase II RFI, groundwater discharging to surface water is not likely to result in COPC concentrations in surface water that exceed the adjusted screening criteria.

### 5.2.2 In-Situ PRB Treatment System

This alternative involves installing an in-situ passive treatment system, likely a PRB, on the southern boundary of the site adjacent to the Grand Calumet River (Pool B groundwater). Installation of a PRB could meet three groundwater RAOs: (1) mitigating off-site migration of constituents that represent a continuing release in groundwater, (2) reduce migration of site-related COPCs from groundwater to surface water discharge points, and (3) reduce site-related constituents in groundwater at the fenceline to the extent practicable. Initially, a PRB system similar to the Pool A system is anticipated; the various components of the PRB system would be as follows:

- ❑ Presently it is estimated that a 30- to 36-inch PRB with a maximum length of 3,000 feet extending down to a depth of 40 feet would be required. The location of the proposed new PRB is shown in Figure 5.1.
- ❑ The PRB could be installed as a single continuous system or in two or three discreet (discontinuous) lengths.
- ❑ Either a funnel and gate system or a straight interception system would be used depending how groundwater would need to be directed through the site due to constructability issues.
- ❑ Detailed planning for the arrangement, orientation, and construction of the PRB would be conducted during the design phase of the project. Similarly, either a biopolymer trenching technique or a conventional construction technique would be used to install the PRB.
- ❑ A bench-scale test would be performed to determine the most suitable PRB material. Based on the success of the PRB in the northern portion of the site, it is likely that basic oxygen furnace (BOF) slag (100% by weight) would be used.

As previously detailed in Section 3.4, the existing PRB has reduced arsenic concentrations in Pool A groundwater. The new PRB would address potential groundwater migration (Pool B) to surface water. Based on the results of the bench-scale treatability studies and economic considerations, an alternate treatment technology may

be proposed during the final remedial design. Existing attenuation processes would augment the effects of the new PRB.

This alternative also involves implementation of institutional controls, such as deed restrictions, to prevent the installation of on-site drinking water supply wells. In addition, groundwater monitoring will be required to evaluate long-term changes in groundwater quality and treatment technology effectiveness.

### 5.3 Identification of Remedial Alternatives

The previous sections presented remedial technologies that could be used to address on-site conditions. This section presents remedial alternatives that combine these technologies to address each of the RAOs identified for the site. Section 5.3.1 presents features that are common to all of the remedial alternatives. Six unique alternatives that could potentially address soil and groundwater conditions on-site are presented in Table 5.1 and in Sections 5.3.2 through 5.3.7.

#### 5.3.1 Common Features of All Alternatives

The following is a general description of the common features of all alternatives:

- ❑ Institutional and administrative controls are in place at the site. Controls that are already in place include industrial zoning, security guards, and intrusive activity permits. Intrusive activity permits are provisions to ensure that anyone conducting subsurface activities at the site in the future considers the appropriate health and safety protection.
- ❑ Engineering controls such as fencing are already present at the site. The existing site perimeter fencing and security will prevent trespassers from direct contact with impacted soils.
- ❑ Deed restrictions will be implemented to ensure that the site is used for only industrial purposes in the future and to prevent the installation of drinking water supply wells on-site, thus minimizing the potential for unacceptable exposure to groundwater COPCs.
- ❑ Localized soil or groundwater data will be collected to confirm the complete extent and source characterization at selected SWMUs and AOCs.
- ❑ Groundwater COPC migration in the shallow aquifer will be monitored to evaluate long-term changes in water quality. The wells that will be monitored are as follows: MW-2 to MW-6, MW-9, MW-10, MW-12, MW-13, MW-15, MW-18, MW-20 to MW-24, and MW-26 to MW-28.
- ❑ The existing PRB reduces potential off-site migration of COPCs in Pool A groundwater.

### **5.3.2 Alternative 1: Institutional Controls for Soil and Groundwater**

This alternative involves implementing only institutional and existing engineering controls for both soil and groundwater so as to prevent contact with either media. This alternative does not include any source control or groundwater mitigation interruption.

### **5.3.3 Alternative 2: Surface Cover for Soil; PRB and Institutional Controls for Groundwater**

To address impacted soil, this alternative involves placing a 1-foot thick surface cover that would prevent human contact with soils that exceed an acute remedial level (Figure 3.2). Based upon ease of installation and consistency with future re-development plans, areas selected for either aggregate or soil cover, so that all areas are covered, will be determined during the predesign phase. This remedial measure can be incorporated into future site re-development plans.

To address impacted groundwater, it is estimated that a 30- to 36-inch PRB with a maximum length of 3,000 feet extending to a depth of 40 feet would be required (Figure 5.1). Detailed planning for the arrangement, orientation, and construction of the PRB would be determined during the design phase of the project. A bench-scale test would be performed to determine the most suitable PRB material. Based on success of the PRB in the northern portion of the site, it is likely that BOF slag (100% by weight) would be used. The new PRB would address the potential migration of groundwater (Pool B) to surface water pathway. In addition, attenuation processes would augment the effects of the new and existing PRB.

This remedial approach would also require deed restrictions and provisions that would ensure the long-term maintenance of the cover.

### **5.3.4 Alternative 3: Asphalt Cover for Soil; PRB and Institutional Controls for Groundwater**

To address impacted soil, this alternative involves installing a 1-foot thick asphalt cover that would prevent human and ecological contact with the underlying soil. This remedial measure can be incorporated into the site re-development plans by adapting re-development plans to the covered areas.

To address impacted groundwater and similar to Alternative 2, this alternative involves installing a new PRB on the southern boundary of the site to address the potential migration of groundwater (Pool B) to surface water pathway. Attenuation processes would augment the effects of both PRBs.

This remedial approach would also require deed restrictions and provisions that would ensure the long-term maintenance of the cover or cap.

### **5.3.5 Alternative 4: Excavation and Off-Site Disposal for Soil; PRB and Institutional Controls for Groundwater**

This alternative involves excavating impacted soils within the 0- to 2-foot interval within specified areas. The excavated soils would then be disposed of at an approved off-site disposal facility. The soils would be disposed of as either nonhazardous or hazardous waste based on the contractions of the COPCs and in accordance with applicable local, state, and federal regulations. The approximate volume of excavated soil would be approximately 54,000 cubic yards (81,000 tons). Once soils were removed, this alternative would require replacing the soils with clean fill material that would not contribute additional constituents to the groundwater or Grand Calumet River.

Because groundwater may contact impacted soil and the soil would not be excavated as deeper than the groundwater table, this alternative would not remove all potential source material for groundwater contamination. As a result, excavation would be augmented with a groundwater control remedy such as installation of a PRB. The new PRB would be installed on the southern site boundary and would address the potential migration of groundwater (Pool B) to surface water pathway. In addition, attenuation processes would augment the effects of both PRBs.

This remedial approach would not require deed restrictions for surface soils, but would require deed restrictions for subsurface soil and groundwater usage to prevent the installation of on-site drinking water supply wells.

### **5.3.6 Alternative 5: In Situ Stabilization for Soil; PRB and Institutional Controls for Groundwater**

This alternative involves in situ stabilization of impacted unsaturated soils by mixing the soil with cement-based or other additive to encapsulate the COPCs in a solid matrix. Stabilization of the top 2 feet of soil would cause the COPCs to be incorporated into a rigid concrete-like matrix, making the COPCs less bioavailable and less mobile. However, because the COPCs do not degrade and are only encapsulated, this alternative may not provide permanent relief from potential exposure to COPCs. This alternative would also limit potential future site re-development because of potential restrictions on disturbing stabilized materials. This alternative would require pilot-scale studies to design the reagent mix and establish viable techniques for an effective in situ delivery system. Long term stability of in-situ stabilization would need to be fully evaluated.

Similar to Alternative 4, groundwater may contact the impacted soil and soil would not be excavated to the groundwater table, so this alternative would not treat all potential source material for groundwater contamination. As a result, excavation would be augmented with a groundwater control remedy such as installation of a PRB. The new PRB would be installed on the southern site boundary and would address the potential migration of groundwater (Pool B) to surface water pathway. In addition, attenuation processes would augment the effects of both PRBs.

In situ stabilization would require deed restrictions to ensure that anyone conducting subsurface activities at the site in the future does not disturb the treated material and the appropriate health and safety precautions have been addressed.

### **5.3.7 Alternative 6: Institutional Controls and PRB**

Details of the institutional and administrative controls are presented in Section 5.3.1. This alternative involves installing a PRB on the southern site boundary adjacent to the Grand Calumet River. This option does not provide protection for infrequent contact with areas that exceed the acute remedial levels.

## 6.0 SCREENING OF ALTERNATIVES

In this section, the potential alternatives discussed in Section 5.0 are evaluated more fully. The detailed analysis of these alternatives is presented to provide the relevant information needed to allow decision makers to select a remedy. Each alternative is assessed against the evaluation criteria as set out in the 61 FR 19432, Section III.C.4.b – Evaluation of Remedial Alternatives, Remedy Selection Criteria. These evaluation criteria serve as the basis for conducting the detailed analyses and for subsequently selecting an appropriate remedial action. The analyses of the alternatives in this CMS are based on the following nine criteria:

- ☐ Threshold criteria
  - Overall protection of human health and the environment
  - Attainment of media cleanup standards
  - Source control
  - Compliance with applicable standards for waste management
- ☐ Balancing criteria
  - Long-term reliability and effectiveness
  - Reduction of toxicity, mobility, and volume of wastes
  - Short-term effectiveness
  - Implementability
  - Cost

The first four criteria are minimum or threshold criteria that must be met by an alternative in order for it to be potentially selected. Media cleanup standards were selected based on realistic current and future use of the site. IDEM RISC Program cleanup standard require that, for closure, soil concentrations are in excess of generic industrial soil cleanup standards would not suitable for industrial use implied by the standard. This site is not being closed, nor it used, in the areas covered by this CMS, for industrial use. Thus, the generic IDEM RISC Program cleanup levels were not used to determine attainment of the threshold criteria.

The next five criteria are considered to be balancing criteria. An evaluation of each of the alternatives developed in Section 5.0 is provided in the subsections below. The protection of environmental receptors will be evaluated separately through a follow-on BERA and possible additional remedial measures, if necessary. Thus, protection of ecological receptors is not part of this CMS. In some instances, the remedy focused on protection of human health may also provide protection for the environment. In these cases, protection of the environment has been noted.

### 6.1 Alternative 1: Institutional Controls for Soil and Groundwater

This alternative includes institutional and administrative controls of the site to address soil and groundwater.

### 6.1.1 Threshold Criteria

☐ **Overall Protection of Human Health**

Even though, risks could be present for infrequent visitors and trespasser use under this scenario that exceed established acceptable risk ranges. Institutional and engineering controls (existing site perimeter fence) are considered protective of human health based on the following:

- These controls would prevent most direct contact with impacted soils.
- Intrusive activity permits would ensure that anyone conducting subsurface activities will use appropriate health and safety protection.
- Deed restrictions would ensure that the site is used for only industrial purposes and that no on-site drinking water wells are installed.

☐ **Attainment of Media Cleanup Standards**

The existing PRB would help attain Pool A groundwater cleanup standards. Institutional controls would mitigate risk thus this alternative would meet the requirements of the ANPR (USEPA, 1996). Because groundwater from Pool B would continue to discharge to the East Branch of the Grand Calumet River, this alternative would not address the NRD settlement. However, attenuation processes such as dispersion and diffusion may help meet the IAWQS in the Grand Calumet River.

☐ **Source Control**

This alternative does not involve any source control but uses exposure mitigation and attenuation processes to manage risks.

☐ **Compliance with Applicable Standards for Waste Management**

This alternative involves monitoring groundwater and does not involve any physical remediation techniques. This alternative would meet all applicable standards for waste management should new monitoring wells be installed and groundwater samples be collected.

### 6.1.2 Balancing Criteria

☐ **Long-Term Reliability and Effectiveness**

Institutional and administrative controls have already been established across the site to regulate intrusive activities and physical barriers are in place to limit exposure (i.e., monitored perimeter fencing). The combination of institutional controls and engineering controls provides continued permanence for this alternative. This alternative would be effective in meeting the RAOs for Pool A groundwater, but would not meet the RAO of reduce COPC migration from Pool B groundwater to surface water.

☐ **Reduction of Toxicity, Mobility, and Volume of Wastes**

This alternative does not decrease the toxicity, mobility, or volume through treatment.

☐ **Short-Term Effectiveness**

Implementation of this alternative would not subject workers to any unacceptable

risks. All well drillers and samplers would require training and medical monitoring in accordance with Occupational Safety and Health Administration (OSHA) regulations. Additionally, personnel would be required to use protective clothing and other personal protective equipment (PPE) as established in a site-specific health and safety plan. Short-term health risks associated with drilling and installing wells would be minimized by work zones, PPE, and engineering controls. Implementation of this alternative would not adversely impact the health and safety of the community during construction. Short-term exposure by trespassers would not be addressed by this alternative.

☐ **Implementability**

Most institutional and engineering controls are already in place at the site. As a result, this alternative can be implemented in a much shorter time frame than the other alternatives.

☐ **Cost**

The cost for this alternative is estimated to be \$54,000 annually for 30 years for a present worth of \$430,000. This would include long term monitoring of groundwater in existing wells along the perimeter of the site.

## **6.2 Alternative 2: Surface Cover for Soil; PRB and Institutional Controls for Groundwater**

This alternative includes a surface cover for soils exceeding acute remedial levels and a PRB and institutional controls for treatment of site-related constituents in groundwater.

### **6.2.1 Threshold Criteria**

☐ **Overall Protection of Human Health**

This alternative would effectively attain RAOs by preventing direct exposure to impacted soils with the installation of an aggregate cover system. The existing and new PRBs would prevent off-site migration of groundwater COPCs exceeding the adjusted screening criteria and, hence, would be protective of human health and ecological receptors in the Grand Calumet River. Deed restrictions would prohibit and/or regulate future re-development of the site. This alternative is also protective through administrative controls that regulate intrusive activities.

☐ **Attainment of Media Cleanup Standards**

The Federal ANPR states that sites should be cleaned up to levels that reflect site-specific usage (USEPA, 1996). The proposed remedial action would address areas with concentrations of site-related constituents in soil in excess of site-specific remedial levels. The existing and new PRBs and attenuation processes would help attain the RAOs for groundwater.

☐ **Source Control**

This alternative does not involve any source control but uses exposure mitigation, groundwater control, and attenuation processes to manage risks.

☐ **Compliance with Applicable Standards for Waste Management**

This alternative would meet all applicable standards for waste management during PRB installation. No waste management is expected to be necessary when installing the surface cover.

## 6.2.2 Balancing Criteria

☐ **Long-Term Reliability and Effectiveness**

This alternative would be effective over the long term. The placement of a surface cover prevents both access to the impacted material and prevents wind or rain erosion of soils. In addition, this alternative would be effective in meeting the RAOs by reducing off-site constituent migration of Pool A groundwater and constituent discharge of Pool B groundwater to surface water. Additional remedial measures to provide a permanent and impermeable surface cover would be anticipated during the site re-development to further mitigate direct contact with impacted soil.

☐ **Reduction of Toxicity, Mobility, and Volume of Wastes**

This alternative includes the installation of a new PRB that, along with the existing PRB, would help decrease the mobility of the groundwater COPCs. This alternative does not include soil treatment; therefore, reduction of toxicity and volume of the impacted soils would not be accomplished. This alternative would provide reduction in mobility by covering the impacted soils.

☐ **Short-Term Effectiveness**

Implementation of this alternative would not subject construction workers to any unacceptable risks. All workers would require training in accordance with OSHA regulations. Additionally, they would be required to use protective clothing and other PPE as established in a site-specific health and safety plan. Operation controls (i.e., work zones and decontamination facilities) would be established to protect workers during the construction period. Short-term health risks from fugitive dust emissions during earth-moving activities would be minimized through dust controls and monitoring. Short-term health risks associated with drilling and installing wells would be minimized by work zones, PPE, and engineering controls. Other hazards to remediation workers would be related to standard construction risks; these would be addressed using standard safety practices. Implementation of this alternative would not adversely impact the health and safety of the community during construction. Dust controls would be used to prevent impact to adjacent properties.

☐ **Implementability**

The surface cover system can be easily implemented. Because a PRB was previously installed at this site, a new PRB can also be readily engineered and constructed. Challenges to implementing this alternative include working in close proximity to the Grand Calumet River during the installation of the PRB. This challenge is not uncommon and can be addressed by using standard construction methods or other innovative techniques such as biopolymer trenching. A number of permits such as sediment and storm water control permits, local construction

permits, and possibly groundwater discharge permits would be required for on-site activities.

☐ **Cost**

The costs for this alternative are provided for each cover material because the specific cover type for each SWMU or AOC will be determined during the predesign investigation. Detailed estimation of costs associated with this Alternative are presented in Appendix F.

<b>SWMU/AOC</b>	<b>Size</b>	<b>Soil Cover</b>	<b>Aggregate Cover</b>
Total Cost to Construct for Soil:	16.78 ac	\$ 2,770,000	\$ 3,842,000
Total Cost to Construct PRB:	3000 LF	\$ 1,766,000	\$ 1,766,000
Long Term Monitoring (Annual cost)		\$ 94,000	\$ 94,000
<b>Present Worth (MM/30 yrs):</b>		<b>\$5.3</b>	<b>\$6.4</b>

### 6.3 Alternative 3: Asphalt Cover for Soil; PRB and Institutional Controls for Groundwater

This alternative includes an asphalt cover for soils exceeding acute remedial levels and a PRB and institutional controls for treatment of site-related constituents in groundwater.

#### 6.3.1 Threshold Criteria

☐ **Overall Protection of Human Health**

This alternative would effectively attain RAOs by preventing direct exposure to impacted soils with the installation of an asphalt cover system. The existing and new PRBs would minimize off-site migration of groundwater COPCs and, hence, would be protective of human health and the environment. Deed restrictions would prohibit and/or regulate future re-development of the site. This alternative is also protective through administrative controls that regulate intrusive activities.

☐ **Attainment of Media Cleanup Standards**

This Alternative would meet Federal ANPR guidance for soil and ground water.

☐ **Source Control**

This alternative does not involve any source control but uses exposure mitigation, groundwater control, and attenuation processes to manage risks.

☐ **Compliance with Applicable Standards for Waste Management**

This alternative would meet all applicable standards for waste management during PRB installation. No waste management is expected to be necessary when implementing the asphalt cover, which can be installed during re-development.

### 6.3.2 Balancing Criteria

☐ **Long-Term Reliability and Effectiveness**

This alternative would be effective over the long term. The placement of an asphalt cover system not only decreases infiltration, but also prevents both access to the impacted material and prevents wind or rain erosion of soils. In addition, this alternative would be effective in meeting the RAOs by preventing off-site migration of Pool A groundwater and discharge of Pool B groundwater to surface water.

☐ **Reduction of Toxicity, Mobility, and Volume of Wastes**

This alternative includes the installation of a new PRB that, along with the existing PRB, would help decrease the mobility of groundwater COPCs. This alternative does not include soil treatment; therefore, reduction of toxicity and volume of the impacted soils would not be accomplished. Reduction in mobility would be accomplished by covering the impacted soils, thereby reducing storm water infiltration or potential fugitive dust generation.

☐ **Short-Term Effectiveness**

Similar to Alternative 2, implementation of this alternative would not subject construction workers to any unacceptable risks.

☐ **Implementability**

The asphalt cover system can be readily engineered and constructed. This alternative requires the same considerations as Alternative 2.

☐ **Cost:**

The costs for this alternative are detailed below.

<b>SWMU/AOC</b>	<b>Size</b>	<b>Asphalt Cover</b>
Total Cost to Construct for Soil:	16.78 ac	\$ 6,315,000
Total Cost to Construct PRB:	3000 LF	\$ 1,766,000
Long Term Monitoring (Annual cost)		\$ 94,000
<b>Present Worth (MM/30 yrs):</b>		<b>\$8.84</b>

### 6.4 Alternative 4: Excavation and Off-Site Disposal for Soil; PRB and Institutional Controls for Groundwater

This alternative includes excavation and off-site disposal for soils with constituent concentrations that exceed acute remedial levels and a PRB and institutional controls for treatment of site-related constituents in groundwater.

### 6.4.1 Threshold Criteria

☐ **Overall Protection of Human Health**

This alternative would effectively attain RAOs by removing the top 2 feet of impacted soils. The existing and new PRBs would reduce off-site groundwater COPC migration. Deed restrictions would prohibit installation of drinking water wells. Therefore, this alternative would be protective of human health.

☐ **Attainment of Media Cleanup Standards**

Similar to Alternatives 2 and 3, it would meet Federal ANPR guidance.

☐ **Source Control**

Source control under this option would be performed for the top two feet of soil; however, this alternative would not completely mitigate the source.

☐ **Compliance with Applicable Standards for Waste Management**

This alternative would comply with all applicable standards for waste management because the excavated soil would be disposed of in accordance with federal, state, and local regulations.

### 6.4.2 Balancing Criteria

☐ **Long-Term Reliability and Effectiveness**

This alternative would be effective over the long term by (1) removing impacted soils that could potentially pose long term risk to human health, (2) eliminating rainwater infiltration through impacted surficial soils, and (3) reducing off-site migration of constituents in Pool A groundwater and surface water discharge of Pool B- related constituents in groundwater.

☐ **Reduction of Toxicity, Mobility, and Volume of Wastes**

This alternative would decrease the toxicity, mobility, and volume of wastes by removing impacted soils within 2 feet of the surface.

☐ **Short-Term Effectiveness**

The short-term effectiveness of this alternative is identical to that of Alternatives 2 and 3.

☐ **Implementability**

Excavation and disposal remedies can be readily implemented; however, this alternative does not support the DuPont Sustainability Initiative to minimize the waste removed from a production facility. Relocating the waste from this site would increase the potential for release at a different site, and would result in transportation of contaminated materials through the community surrounding the site. The PRB implementation issues for this alternative are identical to those listed in Alternative 2.

☐ **Cost**

The cost of soil excavation and removal and a PRB have been estimated for each of the SWMUs and AOCs; the following table presents these costs; a detailed estimation of costs is presented in Appendix F

<b>SWMU/AOC</b>	<b>Size</b>	<b>Excavation</b>
Total Cost to Construct for Soil:	16.78 ac	\$ 21,453,000
Total Cost to Construct PRB:	3000 LF	\$ 1,766,000
Long Term Monitoring (Annual cost)		\$ 94,000
<b>Present Worth (MM/30 yrs):</b>		<b>\$23.98</b>

## 6.5 Alternative 5: In Situ Stabilization for Soil; PRB and Institutional Controls for Groundwater

This alternative includes in-situ stabilization for soils in areas where constituent concentrations exceed acute remedial levels and a PRB and institutional controls for treatment of site-related constituents in groundwater.

### 6.5.1 Threshold Criteria

#### ☐ Overall Protection of Human Health

This alternative would effectively attain RAOs by stabilizing the top 2 feet of impacted soils. Similar to Alternative 3, groundwater impacts would be addressed with the existing and new PRBs. Institutional and engineering controls would effectively mitigate the potential for exposure because:

- Prevention of direct contact with impacted soils and intrusive activity permits would ensure that stabilized areas are protected from disturbance and anyone conducting subsurface activities outside of these areas would use appropriate health and safety protection.
- Deed restrictions would ensure that the site is used for only industrial purposes and that no drinking water wells are installed on-site.

This scenario would provide protection of human health from potentially acute concentrations of constituents in on-site soils.

#### ☐ Attainment of Media Cleanup Standards

This alternative would meet the Federal ANPR guidance for both soil and groundwater.

#### ☐ Source Control

This alternative mitigates a portion of source (the upper two feet of soil). However, it is unknown if stabilized soils degrade in the long term, resulting in re-release of COPCs to groundwater. In addition, because stabilization is proposed only in the upper 2 feet of soil, this alternative does not provide complete source control for the protection of groundwater.

☐ **Compliance with Applicable Standards for Waste Management**

This alternative would be similar to that of Alternatives 2 and 3 for this threshold criterion.

## 6.5.2 Balancing Criteria

☐ **Long-Term Reliability and Effectiveness**

The long-term effectiveness of this alternative is unknown because the long-term structural integrity of the stabilized mass is unknown. Re-release of COPCs from stabilized materials could occur as a result of natural degradation processes. Similar to previous alternatives, the PRB would be effective in meeting the RAOs by controlling off-site migration of constituents in Pool A groundwater and discharge of Pool B groundwater to surface water.

☐ **Reduction of Toxicity, Mobility, and Volume of Wastes**

This alternative would not decrease the toxicity or volume of waste. This alternative would decrease the mobility over the short term, although its effectiveness over the long term is unknown.

☐ **Short-Term Effectiveness**

The short-term effectiveness of this alternative is identical to that of Alternative 3.

☐ **Implementability**

Pilot-scale studies would be required to design the additive mix and establish viable techniques for an effective in situ delivery system. In addition, placement of stabilized materials would be likely to diminish the flexibility of future re-development of the site because the integrity of stabilized material could not be compromised as a result of cutting, breaking, or movement.

☐ **Cost**

The total estimate for in situ stabilization is \$8.5 million with an additional \$1.76 million for the PRB. A summary of the cost analysis is provided below with additional detail provided in Appendix F.

<b>SWMU/AOC</b>	<b>Size</b>	<b>Excavation</b>
Total Cost to Construct for Soil:	16.78 ac	\$ 8,506,000
Total Cost to Construct PRB:	3000 LF	\$ 1,766,000
Long Term Monitoring (Annual cost)		\$ 94,000
<b>Present Worth (MM/30 yrs):</b>		<b>\$9.26</b>

## 6.6 Alternative 6: Institutional Controls and PRB

This alternative involves implementing only institutional and existing engineering controls for soil to prevent contact and a PRB to mitigate off-site migration of constituents that represent a continuing release in groundwater. This alternative does not include any source control or groundwater mitigation interruption.

### 6.6.1 Threshold Criteria

☐ **Overall Protection of Human Health**

Even though, risks could be present for infrequent visitors and trespasser use under this scenario that exceed established acceptable risk ranges. Institutional and engineering controls (deed restriction and existing site perimeter fence) are protective of human health because of the following:

- These controls would prevent unauthorized direct contact with impacted soils.
- Intrusive activity permits would ensure that anyone conducting subsurface activities would use appropriate health and safety protection.
- Deed restrictions would ensure that the site is used for only industrial purposes and that no drinking water wells are installed on-site.

The existing and new PRBs would reduce off-site migration of groundwater COPCs and, hence, would be protective of human health.

☐ **Attainment of Media Cleanup Standards**

Similar to other alternatives this alternative would address the intent of Federal guidelines from the ANPR. In addition the new PRB would help mitigate the groundwater to surface water pathway.

☐ **Source Control**

This alternative does not involve any source control but uses exposure mitigation, groundwater control, and attenuation processes to manage risks.

☐ **Compliance with Applicable Standards for Waste Management**

This alternative would meet all applicable standards for waste management during the installation of the PRB.

### 6.6.2 Balancing Criteria

☐ **Long-Term Reliability and Effectiveness**

The existing PRB has been reliable and effective in controlling groundwater COPC migration at the site. The installation of a new PRB is expected to be equally reliable and effective.

☐ **Reduction of Toxicity, Mobility, and Volume of Wastes**

This alternative includes the installation of a new PRB, which along with the existing PRB, would help decrease the mobility of groundwater COPCs. This alternative does not include soil treatment; therefore, reduction of toxicity and volume of the impacted soils would not be accomplished.

☐ **Short-Term Effectiveness**

The short-term effectiveness of this alternative is identical to that of the groundwater portion of Alternative 2.

☐ **Implementability**

PRB implementation issues would be identical to those listed in Alternative 2.

☐ **Cost**

The cost for this alternative includes only those for the PRB and present worth of \$2,520,000.

A comparison of total costs, including long-term monitoring is provided for each of the Alternatives in Appendix F.

## 7.0 ANALYSIS AND RECOMMENDATION

### 7.1 Comparative Alternatives Analysis

This section presents a comparative analysis of alternatives. Each of the factors is weighed so that the best alternative for this site can be selected. Because protectiveness, price, and effectiveness are weighed, the selected alternative may not be the “best” at any one criterion. However, the recommended alternative represents the best compromise available for the site. Table 7.1 presents a comparison of the alternatives with the selection criteria.

### 7.2 Recommended Alternative

Based on the comparative alternatives analysis, Alternative 2, surface cover for soil and a PRB, is the recommended remedial action for the site. This alternative is recommended for the following reasons:

- ❑ The alternative includes institutional, engineering and administrative controls that will prevent direct contact with impacted soils. Remedial actions planned with this alternative will be protective of human health under both potential acute and long-term exposures, and institutional controls will require that anyone conducting subsurface activities use appropriate health and safety protection. In addition, deed restrictions will ensure that the site is used for only industrial purposes and that no drinking water wells are installed on-site, thus minimizing the potential for unacceptable exposure to groundwater COPCs.
- ❑ The existing PRB addresses potential off-site migration of COPCs in Pool A-West groundwater and meet applicable remedial standards. Additional evaluation of Pool A-East groundwater will be undertaken. If it is determined to be affected by past production-related activities, then additional groundwater treatment or source control will be evaluated.
- ❑ Installation of a new PRB will address the potential migration of Pool B groundwater into the Grand Calumet River and will help to mitigate the groundwater to surface water pathway.
- ❑ Future re-development is likely to include features such as asphalt parking lots, paving, and sidewalks—all of which would enhance the protectiveness of this alternative. The placement of aggregate as a component of this alternative provides beneficial site preparation activities for future re-development. In addition, this alternative can be easily upgraded to Alternative 3 (asphalt cover system) or some other protective alternative, if required, during site re-development.
- ❑ This alternative includes development of a refined ecological risk assessment. The potential ecological risk is currently based on comparison to very conservative and generic screening levels. Therefore, a more site-specific

ecological risk assessment will be performed in addition to implementing the corrective measure. The refined ecological risk assessment will take into consideration and will incorporate site-specific factors. Based on the results of the refined ecological risk assessment, any remedial measure(s) required to address the ecological pathway will then be implemented as part of the corrective measure.

A summary of the remedial decisions for each SWMU and AOC is presented in Table 7.2. For those SWMUs or AOCs that have been identified as requiring remedial action to address potential exposure to site soils, a predesign investigation will be undertaken to fully characterize each area. For SWMUs or AOCs that have not been identified as requiring remedial actions but that previously were identified as requiring consideration in the CMS, existing Administrative controls will address the hypothetical risks identified in the HH BLRA and no additional remedial action is necessary under the current and future use scenarios.

## 8.0 REFERENCES

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## TABLES

**Table 1.1**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
SWMU 1A	Ash Landfill/Stoker Grate Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	Potential migration of constituent to groundwater south of PRB addressed by PRB. SWMU north of PRB to be addressed in CMS.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address human health and GW migration concerns
SWMU 1B	Calcium Sulfate and TSP Area	NFA-HH	Surf soils a potential ecological concern	NFA (Phase I).	<b>BERA</b> to address Eco concerns.
SWMU 1C	Rubble Fill Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	NFA: Phase II RFI indicated that constituents in soil that exceeded the regulatory potential migration number were not detected at concentrations of interest in groundwater; therefore potential for release to GW is low.	BERA to address Eco concerns. Subsequent <b>CMS</b> will be performed to address HH BLRA.
SWMU 1H	PCB Storage Area in Rubble Fill Area	NFA-HH	NFA	NFA (Phase I).	Include in <b>BERA</b> with SWMU 1C
SWMU 1I	Miscellaneous Pits and Piles—North	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	Potential migration of constituent to groundwater south of PRB addressed by PRB. SWMU north of PRB to be addressed in CMS.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address human health and GW migration concerns
SWMU 1J	Miscellaneous Pits and Piles—South	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	CMS recommended - potential for release to groundwater.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address human health and GW concerns.
SWMU 1K	Spill Areas—South of Ash Landfill/Stoker Grate Area	NFA-HH	NFA	NFA: (Phase I).	Include in <b>BERA</b> and Risk Management with SWMU 1A
SWMU 2B					
SWMU 2C	East Pile	NFA-HH	Surf soils a potential ecological concern	NFA: GW not a concern based soil constituents and nearby well results (Phase II).	<b>BERA</b> to assess Eco concerns.
SWMU 2D	Far East Pile	NFA-HH	Collect surf soil samples and assess potential for ecological concern.	NFA: (Phase I).	<b>BERA</b> to assess Eco concerns.

**Table 1.1**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
SWMU 3	Disposal Area Near Former Chrome Outfall	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	Constituent migration to GW a potential concern.	A <b>limited GW study</b> will be performed to address potential migration concern. A <b>CMS</b> will be performed to address HHBLRA.
SWMU 4	Insecticide Disposal Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern.	CMS recommended - potential for release to groundwater.	A <b>CMS</b> will be performed to address HH and GW migration concerns.
SWMU 5	PCB Electrical Storage Yard	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I).	<b>NFA: (Phase II)</b>
SWMU 6A	Waste Solvent Tank	Dismissed - No COPCs or complete pathways identified.	NFA	NFA: (Phase I).	<b>NFA: (Phase II)</b>
SWMU 6E	Flue Dust Storage near North Warehouse	Dismissed - No COPCs or complete pathways identified.	NFA	NFA: (Phase I).	<b>NFA: (Phase II)</b>
SWMU 7	Abandoned Chemical Storage Building-"The Morgue"	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern.	Constituent migration to GW a potential concern.	A <b>limited GW study</b> will be performed to address potential migration concern. A <b>CMS</b> will be performed to address HHBLRA.
SWMU 8	Zinc Roaster Sinter Area	NFA-HH	Surf soils a potential ecological concern.	NFA:(Phase I)	<b>BERA</b> to assess ecological concerns.
SWMU 10A	North Pit	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	NFA:(Phase I)	A <b>CMS</b> will be performed to address HHBLRA concerns. <b>BERA</b> to assess Eco concerns.

**Table 1.1**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
SWMU 10B	West Pit	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern. Collect surf soil samples and assess potential for ecological concern.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.
SWMU 10C	South Pit	NFA-HH	Collect surf soil samples and assess potential for ecological concern.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.
SWMU 10D	Far North Pit	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	NFA:Subsurf soil conc similar to just slightly higher than reg value for migration to GW. NFA recommended for GW (Phase II).	A <b>CMS</b> will be performed to address HHBLRA and Eco concerns
SWMU 11	Sulfamic Acid Pits (2)	NFA-HH	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.
SWMU 12A	North Basin	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	NFA if SWMU filled-in	Sediment conc exceed reg value for migration to GW (Phase II).	A <b>CMS</b> will be performed to address HHBLRA and RFI concerns
SWMU 12B	South Basin	NFA-HH	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	CMS - Potential for release to GW based on concentrations and location to HCL spill (Phase II).	A <b>CMS</b> will be performed to address RFI concerns
SWMU 14	Chrome Outfall and Impoundment	NFA-HH	Collect surf soil samples and assess potential for ecological concern.	CMS: A single subsurface soil sample exceeded regulatory potential migration values by approx 6 times.	<b>BERA</b> to be performed. Subsequent <b>CMS</b> to address GW migration potential and, if applicable, eco concerns.
SWMU 15	Former Wastewater Treatment System (Outfall 002)	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
SWMU 17B	Process Sewers	NFA-Phase1	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>

**Table 1.1**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
SWMU 20	I-90 Fill Area	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
SWMU 21	Lead Arsenate Sludge Disposal Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed in the BERA.	Potential for release to GW based on Phase II assessment.	A <b>CMS</b> will be performed to address HHBLRA, RFI concerns
AOC 1C	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.
AOC 1D	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 1E	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 1F	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.
AOC 1G	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	NFA	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>NFA: (Phase II)</b>

Table 1.1

## Review of Assessments and Resulting Path Forward

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
AOC 2A	Railroad Loading and Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.
AOC 2B		NFA-HH	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.
AOC 2C	Railroad Loading and Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.
AOC 2D		Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.
AOC 2E		Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed through a BERA.	Potential for release to GW based on Phase II assessment.	A <b>CMS</b> will be performed to address HHBLRA, RFI, and Eco concerns
AOC 2F		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>No Further Action Recommended</b>
AOC 3A1		Dismissed - No COPCs or complete pathways identified.	Potential surf soil ecological concern. Ecological concerns to be addressed through a BERA.	CMS - Potential for release to GW based on concentrations and location to HCL spill (Phase II).	A <b>CMS</b> will be performed to address RFI and Eco concerns

**Table 1.1**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
AOC 3A2	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.
AOC 3B	Aboveground Storage Tanks	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 3C1		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 3C2		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 3D		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 3E	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.
AOC 3H	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.
AOC 3I		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 3J	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>

Table 1.1

## Review of Assessments and Resulting Path Forward

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
AOC 5	Beneath Former Contact No.1	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.
AOC 6	Zinc Crude Milling Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Low to No potential for concerns pertaining to air, DC, GW, and run-off (Phase I).	<b>BERA</b> to assess Eco concerns.
AOC 8	Former Powerhouse Pit	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 11	Ditch and Associated Materials	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC 12	Area East of Freon Area South of ASTs	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Collect surf soil samples and assess potential for ecological concern.	NFA:(Phase I)	<b>BERA</b> to address Eco concerns.
AOC 13	Conoco Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	NFA: Potential for migration of constituents to GW not a concern based on comparison of soil results to near by monitor well results.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address HH concerns and, if applicable, Eco concern.
AOC 14	Former Insecticides Warehouse	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>
AOC GW A	Pool A Groundwater	Potential ingestion concern for future site manufacturers and construction workers. Air not a concern.	Not Applicable	GW migrating north to residential area is being treated by PRB. Long term monitoring is being performed to understand impact of SWMUs/AOCs on GW.	<b>Long Term GW Monitoring and Deed Restriction</b> to prevent ingestion by future site manufacturing and construction workers.

Table 1.1

## Review of Assessments and Resulting Path Forward

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations
AOC GW B	Pool B Groundwater	Potential ingestion concern for future site manufacturers and construction workers. Air not a concern.	Not Applicable	GW migrates to East Branch of Grand Calumet River. Phase I RFI concluded that surface waters were not adversely impacted by groundwater discharges. Long term monitoring is being performed to understand impact of SWMUs/AOCs on GW.	<b>Long Term GW Monitoring and Deed Restriction</b> to prevent ingestion by future site manufacturing and construction workers.

HH = Human Health Baseline Risk Assessment

Eco = Ecological Risk Assessment

Phase I = DuPont Phase I RFI

Phase II = DuPont Phase II RFI

DC = Direct Contact

air = Release to Air

GW = Migration to Groundwater

Runoff = Surface water runoff

BERA = Baseline Environmental Risk Assessment

BERA-SS = BERA with surficial soil sampling

HHBLRA = Human Health Base Line Risk Assessment

CMS = Corrective Measures Study

RFI = RCRA Facility Investigation

RCRA = Resource Conservation Recovery Act

NFA = No Further Action

Table 3.1  
Summary of Revised Risk Characterization Results in Soil  
DuPont East Chicago Facility  
East Chicago, Indiana

Current/Future Land Use - RME

SWMUs/AOCs		On-Site Industrial Worker			On-Site Construction Worker			On-Site Trespasser		
		Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR
SWMU 1A	Ash Landfill/Stoker Grate Area	10	8	2.E-03	30	30	2.E-04	3	2	2.E-04
SWMU 1B	Calcium Sulfate and TSP Area	0.06	-	9.E-06	0.3	-	2.E-06	0.02	-	1.E-06
SWMU 1C	Rubble Fill Area	1	0.9	2.E-04	3	3	2.E-05	0.3	-	2.E-05
SWMU 1I	Miscellaneous Pits and Piles—North	7	3	6.E-04	20	10	8.E-05	2	0.9	7.E-05
SWMU 1J	Miscellaneous Pits and Piles—South	60	50	1.E-02	200	160	2.E-03	20	14	1.E-03
SWMU 1K	Spill Areas—South of Ash Landfill/Stoker Grate Area				0.04	-	3.E-07			
SWMU 2C	East Pile	0.1	-	2.E-05	1	0.9	8.E-06	0.03	-	2.E-06
SWMU 2D	Far East Pile	0.6	-	8.E-06	2	0.8	3.E-06	0.2	-	9.E-07
SWMU 3	Disposal Area Near Former Chrome Outfall	1	0.4	6.E-05	8	2	1.E-05	0.3	-	6.E-06
SWMU 4	Insecticide Disposal Area	60	50	9.E-03	200	150	1.E-03	20	13	1.E-03
SWMU 7	Abandoned Chemical Storage Building—"The Morgue"	10	4	7.E-04	200	110	9.E-04	3	1	8.E-05
SWMU 8	Zinc Roaster Sinter Area	0.5	-	3.E-05	2	0.6	4.E-06	0.1	-	3.E-06
SWMU 10A	HCl Neutralization Pit North Pit	5	3	6.E-04	20	10	7.E-05	1	0.9	6.E-05
SWMU 10B	HCl Neutralization Pit West Pit	3	1	2.E-04	9	5	2.E-05	0.9	-	2.E-05
SWMU 10C	HCl Neutralization Pit South Pit	0.03	-	4.E-06	0.08	-	5.E-07	0.007	-	5.E-07
SWMU 10D	HCl Neutralization Pit Far North Pit	20	10	1.E-04	70	40	1.E-05	6	3	1.E-05
SWMU 11	Sulfamic Acid Pits (2)				0.1	-	6.E-07			
SWMU 12A	Antimony Pentachloride Settling Basin, North Basin	7	6	1.E-03	20	20	1.E-04	2	2	1.E-04
SWMU 12B	Antimony Pentachloride Settling Basin, South Basin	0.1	-	2.E-05	3	2	2.E-05	0.04	-	2.E-06
SWMU 14	Chrome Outfall and Impoundment	2	2	3.E-04	9	5	5.E-05	0.6	-	3.E-05
SWMU 15	Former Wastewater Treatment System (Outfall 002)				0.2	-	1.E-06			
SWMU 20	I-90 Fill Area	0.01	-	2.E-06	0.09	-	6.E-07	0.004	-	3.E-07
SWMU 21	Lead Arsenate Sludge Disposal Area	2	0.7	1.E-04	20	8	7.E-05	0.4	-	1.E-05
AOC 2B	Railroad Loading/Unloading Area	0.6	-	3.E-05	2	0.7	4.E-06	0.2	-	4.E-06
AOC 2E	Railroad Loading/Unloading Area	10	10	2.E-03	60	30	4.E-04	4	3	2.E-04
AOC 3B	Aboveground Storage Tank Area				0.002	-	5.E-10			
AOC 6	Zinc Crude Milling Area	1	-	9.E-05	3	2	1.E-05	0.3	-	1.E-05
AOC 8	Former Powerhouse Pit				0.08	-	5.E-07			
AOC 11	Ditch and Associated Materials	0.02	-	3.E-06	0.09	-	6.E-07	0.006	-	4.E-07
AOC 12	Area East of Freon Area South of ASTs	2	1	6.E-05	7	3	7.E-06	0.6	-	6.E-06
AOC 13	Conoco Area	6	2	5.E-04	30	8	1.E-04	2	0.7	5.E-05
AOC 14	Former Insecticides Warehouse				0.03	-	2.E-07			

**Table 3.1**  
**Summary of Revised Risk Characterization Results in Soil**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

**Current/Future Land Use - CT**

SWMUs/AOCs		On-Site Industrial Worker			On-Site Construction Worker			On-Site Trespasser		
		Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR
SWMU 1A	Ash Landfill/Stoker Grate Area	1	0.9	5.E-05	2	1	9.E-06	0.08	-	5.E-06
SWMU 1B	Calcium Sulfate and TSP Area	0.07	-	3.E-07	0.01	-	1.E-07	0.0004	-	3.E-08
SWMU 1C	Rubble Fill Area	0.1	-	6.E-06	0.1	-	9.E-07	0.08	-	5.E-07
SWMU 1I	Miscellaneous Pits and Piles—North	0.8	-	2.E-05	0.9	-	3.E-06	0.05	-	2.E-06
SWMU 1J	Miscellaneous Pits and Piles—South	8	5	3.E-04	10	7	7.E-05	0.5	-	3.E-05
SWMU 1K	Spill Areas—South of Ash Landfill/Stoker Grate Area				0.002	-	1.E-08			
SWMU 2C	East Pile	0.01	-	5.E-07	0.06	-	4.E-07	0.0008	-	5.E-08
SWMU 2D	Far East Pile	0.07	-	3.E-07	0.1	-	1.E-07	0.005	-	2.E-08
SWMU 3	Disposal Area Near Former Chrome Outfall	0.1	-	2.E-06	0.4	-	7.E-07	0.08	-	2.E-07
SWMU 4	Insecticide Disposal Area	7	5	3.E-04	9	7	6.E-05	0.4	-	3.E-05
SWMU 7	Abandoned Chemical Storage Building—"The Morgue"	1	0.4	3.E-05	7	5	4.E-05	0.07	-	2.E-06
SWMU 8	Zinc Roaster Sinter Area	0.06	-	1.E-06	0.07	-	2.E-07	0.004	-	9.E-08
SWMU 10A	HCl Neutralization Pit North Pit	0.6	-	2.E-05	0.7	-	3.E-06	0.04	-	2.E-06
SWMU 10B	HCl Neutralization Pit West Pit	0.4	-	5.E-06	0.4	-	9.E-07	0.02	-	5.E-07
SWMU 10C	HCl Neutralization Pit South Pit	0.003	-	1.E-07	0.004	-	2.E-08	0.0002	-	1.E-08
SWMU 10D	HCl Neutralization Pit Far North Pit	3	1	1.E-05	3	2	5.E-07	0.2	-	3.E-07
SWMU 11	Sulfamic Acid Pits (2)				0.004	-	3.E-08			
SWMU 12A	Antimony Pentachloride Settling Basin, North Basin	0.9	-	4.E-07	1	0.9	6.E-06	0.06	-	4.E-06
SWMU 12B	Antimony Pentachloride Settling Basin, South Basin	0.02	-	7.E-07	0.1	-	7.E-07	0.001	-	6.E-08
SWMU 14	Chrome Outfall and Impoundment	0.3	-	1.E-05	0.4	-	2.E-06	0.02	-	9.E-07
SWMU 15	Former Wastewater Treatment System (Outfall 002)				0.007	-	5.E-08			
SWMU 20	I-90 Fill Area	0.004	-	2.E-07	0.009	-	5.E-08	0.0002	-	1.E-08
SWMU 21	Lead Arsenate Sludge Disposal Area	0.2	-	3.E-06	0.8	-	3.E-06	0.01	-	3.E-07
AOC 2B	Railroad Loading/Unloading Area	0.08	-	1.E-06	0.09	-	2.E-07	0.005	-	1.E-07
AOC 2E	Railroad Loading/Unloading Area	2	1	7.E-05	3	2	2.E-05	0.1	-	6.E-06
AOC 3B	Aboveground Storage Tank Area				0.00007	-	2.E-11			
AOC 6	Zinc Crude Milling Area	0.1	-	3.E-06	0.1	-	5.E-07	0.008	-	3.E-07
AOC 8	Former Powerhouse Pit				0.01	-	1.E-07			
AOC 11	Ditch and Associated Materials	0.005	-	2.E-07	0.008	-	5.E-08	0.0003	-	2.E-08
AOC 12	Area East of Freon Area South of ASTs	0.3	-	2.E-06	0.3	-	3.E-07	0.02	-	2.E-07
AOC 13	Conoco Area	0.7	-	2.E-05	2	0.4	4.E-06	0.04	-	1.E-06
AOC 14	Former Insecticides Warehouse				0.001	-	7.E-09			

RME - Reasonable Maximum Exposure

CT - Central Tendency

Incomplete Pathway under current land use conditions

Incomplete Pathway under current and future land use conditions

10 - Exceeds HI=1 or Risk=  $1 \times 10^{-4}$

**Notes:**

HI - Hazard index for noncancer effects.

CR = Cancer risk. Cancer risk levels between  $1\text{E-}06$  and  $1\text{E-}04$  (1 in 1 million to 1 in 10,000) are considered to be generally acceptable (IDEM, 2001).

(a) "Total HI" is shown for total HIs less than or equal to 1, regardless of whether constituent effects are additive or not (based on target organ affected).

(b) If the total HI was greater than 1, the maximum HI for constituents that affect the same target organ is also shown (see Appendix D).

**Table 3.2**  
**Summary of Revised Risk Characterization Results in Soil by Exposure Area**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

**Current/Future Land Use - RME**

SWMUs/AOCs		On-Site Industrial Worker			On-Site Construction Worker			On-Site Trespasser		
		Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR
Exposure Area 1: Active Manufacturing Area										
AOC 8	Former Powerhouse Pit				0.08	-	5.E-07			
Exposure Area 2: Re-Development Area										
Previous Manufacturing Area										
SWMU 2C	East Pile	0.1	-	2.E-05	1	0.9	8.E-06	0.03	-	2.E-06
SWMU 3	Disposal Area Near Former Chrome Outfall	1	0.4	6.E-05	8	2	1.E-05	0.3	-	6.E-06
SWMU 4	Insecticide Disposal Area	60	50	9.E-03	200	150	1.E-03	20	13	1.E-03
SWMU 8	Zinc Roaster Sinter Area	0.5	-	3.E-05	2	0.6	4.E-06	0.1	-	3.E-06
SWMU 11	Sulfamic Acid Pits (2)				0.1	-	6.E-07			
SWMU 12B	Antimony Pentachloride Settling Basin, South Basin	0.1	-	2.E-05	3	2	2.E-05	0.04	-	2.E-06
SWMU 14	Chrome Outfall and Impoundment				9	5	5.E-05	0.6	-	3.E-05
SWMU 15	Former Wastewater Treatment System (Outfall 002)				0.2	-	1.E-06			
SWMU 21	Lead Arsenate Sludge Disposal Area	2	0.7	1.E-04	20	8	7.E-05	0.4	-	1.E-05
AOC 2B	Railroad Loading/Unloading Area	0.6	-	3.E-05	2	0.7	4.E-06	0.2	-	4.E-06
AOC 2E	Railroad Loading/Unloading Area	10	10	2.E-03	60	30	4.E-04	4	3	2.E-04
AOC 3B	Aboveground Storage Tank Area				0.002	-	5.E-10			
AOC 6	Zinc Crude Milling Area	1	-	9.E-05	3	2	1.E-05	0.3	-	1.E-05
AOC 14	Former Insecticides Warehouse				0.03	-	2.E-07			
WMA North (excludes restricted areas)										
SWMU 1A	Ash Landfill/Stoker Grate Area	10	8	2.E-03	30	30	2.E-04	3	2	2.E-04
SWMU 1B	Calcium Sulfate and TSP Area	0.06	-	9.E-06	0.3	-	2.E-06	0.02	-	1.E-06
SWMU 1J	Miscellaneous Pits and Piles—South	60	50	1.E-02	200	160	2.E-03	20	14	1.E-03
SWMU 1K	Spill Areas—South of Ash Landfill/Stoker Grate Area				0.04	-	3.E-07			
SWMU 7	Abandoned Chemical Storage Building—"The Morgue"	10	4	7.E-04	200	110	9.E-04	3	1	8.E-05
AOC 13	Conoco Area	6	2	5.E-04	30	8	1.E-04	2	0.7	5.E-05
WMA South										
SWMU 2D	Far East Pile	0.6	-	8.E-06	2	0.8	3.E-06	0.2	-	9.E-07
SWMU 10A	HCl Neutralization Pit North Pit	5	3	6.E-04	20	10	7.E-05	1	0.9	6.E-05
SWMU 10B	HCl Neutralization Pit West Pit	3	1	2.E-04	9	5	2.E-05	0.9	-	2.E-05
SWMU 10C	HCl Neutralization Pit South Pit	0.03	-	4.E-06	0.08	-	5.E-07	0.007	-	5.E-07
SWMU 10D	HCl Neutralization Pit Far North Pit	20	10	1.E-04	70	40	1.E-05	6	3	1.E-05
SWMU 12A	Antimony Pentachloride Settling Basin, North Basin	7	6	1.E-03	20	20	1.E-04	2	2	1.E-04
SWMU 20	I-90 Fill Area	0.01	-	2.E-06	0.09	-	6.E-07	0.004	-	3.E-07
AOC 11	Ditch and Associated Materials	0.02	-	3.E-06	0.09	-	6.E-07	0.006	-	4.E-07
AOC 12	Area East of Freon Area South of ASTs	2	1	6.E-05	7	3	7.E-06	0.6	-	6.E-06
Restricted Areas										
SWMU 1C	Rubble Fill Area	1	0.9	2.E-04	3	3	2.E-05	0.3	-	2.E-05
SWMU 1I	Miscellaneous Pits and Piles—North	7	3	6.E-04	20	10	8.E-05	2	0.9	7.E-05

Table 3.2  
Summary of Revised Risk Characterization Results in Soil by Exposure Area  
DuPont East Chicago Facility  
East Chicago, Indiana

Current/Future Land Use - CT

SWMUs/AOCs	On-Site Industrial Worker			On-Site Construction Worker			On-Site Trespasser		
	Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR	Total HI (a)	Max HI by Target Organ (b)	CR
Exposure Area 1: Active Manufacturing Area				0.01	-	1.E-07			
Exposure Area 2: Re-Development Area									
Previous Manufacturing Area	10	6	4.E-04	14	7	9.E-05	0.6	-	4.E-05
WMA North (excludes restricted areas)	10	6	4.E-04	20	7	1.E-04	0.7	-	4.E-05
WMA South	5	1	4.E-05	6	2	1.E-05	0.3	-	7.E-06
Restricted Areas	0.9	-	3.E-05	1	-	4.E-06	0.1	-	3.E-06

RME - Reasonable Maximum Exposure

WMA - Waste Management Area

  Incomplete Pathway under current land use conditions

  Incomplete Pathway under current and future land use conditions

CT - Central Tendency

10 - Exceeds HI=1 or Risk=  $1 \times 10^{-4}$

**Notes:**

HI - Hazard index for noncancer effects. Total HI and/or target organ HI of one or less is considered acceptable (IDEM, 2001).

CR = Cancer risk. Cancer risk levels between 1E-06 and 1E-04 (1 in 1 million to 1 in 10,000) are considered to be generally acceptable (IDEM, 2001).

(a) "Total HI" is shown for total HIs less than or equal to 1, regardless of whether constituent effects are additive or not (based on target organ affected).

(b) If the total HI was greater than 1, the maximum HI for constituents that affect the same target organ is also shown (see Appendix D).

**Table 3.3**  
**Revised Lead Concentrations in Soil Compared to Land Use Screening Levels**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

SWMU/AOC	Media	Min	Max	Mean	No. samples	No. Samples > Industrial Worker Value (1,300 mg/kg)	No. Samples > Construction Worker Value (2,625 mg/kg)	Mean > SL
<b>Exposure Area 2: Re-Development Area</b>								
<b>Previous Manufacturing Area</b>								
SWMU 2C	Surface Soil	1.20E+02	1.31E+03	5.96E+02	4	1	0	No
SWMU 3	Surface Soil	3.89E+02	1.37E+04	3.16E+03	9	4	3	Yes
SWMU 3	Subsurface Soil	4.52E+01	2.85E+04	4.04E+03	15	11	4	Yes
SWMU 4	Surface Soil	3.12E+02	8.93E+04	2.17E+04	9	6	5	Yes
SWMU 4	Subsurface Soil	2.00E+00	4.32E+03	6.19E+02	13	1	1	No
SWMU 8	Surface Soil	4.77E+01	1.29E+03	6.54E+02	4	0	0	No
SWMU 14	Surface Soil	2.07E+00	2.90E+03	1.05E+03	7	2	1	No
SWMU 21	Surface Soil	1.56E+02	4.50E+03	1.38E+03	9	3	1	Yes
SWMU 21	Subsurface Soil	3.10E+00	7.00E+03	1.29E+03	20	9	1	No
AOC 2B	Surface Soil	6.97E+02	1.41E+03	1.20E+03	4	2	0	No
AOC 2E	Surface Soil	9.41E+01	1.73E+04	3.43E+03	7	2	2	Yes
AOC 2E	Subsurface Soil	2.63E+01	2.91E+03	7.32E+02	7	1	0	No
AOC 6	Surface Soil	7.92E+02	1.62E+04	7.83E+03	7	5	5	Yes
<b>WMA North (excludes restricted areas)</b>								
SWMU 1A	Surface Soil	1.32E+02	2.32E+04	1.04E+04	9	8	7	Yes
SWMU 1A	Subsurface Soil	3.30E+00	2.72E+03	4.33E+02	7	1	0	No
SWMU 1B	Surface Soil	1.34E+02	7.85E+02	1.82E+02	9	0	0	No
SWMU 1J	Surface Soil	2.14E+03	5.83E+04	1.51E+04	9	9	8	Yes
SWMU 1J	Subsurface Soil	2.80E+00	7.53E+04	1.42E+04	16	12	10	Yes
SWMU 7	Surface Soil	6.76E+03	1.38E+05	5.56E+04	9	9	9	Yes
SWMU 7	Subsurface Soil	4.30E+00	1.78E+05	3.77E+04	8	4	4	Yes
AOC 13	Surface Soil	4.56E+02	6.56E+04	2.01E+04	10	9	7	Yes
AOC 13	Subsurface Soil	2.70E+00	3.66E+04	9.70E+03	8	3	3	Yes
<b>WMA South</b>								
SWMU 10A	Surface Soil	9.06E+01	2.16E+03	7.17E+02	4	1	0	No
SWMU 10B	Surface Soil	1.40E+05	1.47E+05	1.44E+05	2	2	2	Yes
SWMU 10D	Surface Soil	2.05E+03	1.44E+05	3.80E+04	5	5	2	Yes
AOC 12	Surface Soil	2.49E+02	1.24E+05	2.08E+04	9	3	3	Yes
<b>Restricted Areas</b>								
SWMU 1C	Surface Soil	5.00E+01	3.39E+03	1.19E+03	5	1	0	No
SWMU 1C	Subsurface Soil	5.00E+00	8.17E+02	3.80E+02	4	0	0	No
SWMU 1I	Surface Soil	3.12E+03	3.62E+04	1.54E+04	4	4	3	Yes
Natural Area Buffer Zone <sup>1</sup>	Surface Soil	2.07E+00	1.24E+05	7.56E+03	24	5	4	Yes

**Notes:**

1) Runoff samples RNOF-01, 02, 04 and 05 are included both with individual SWMUs and AOCs (SWMUs 10C and 14 and AOC 12), and with the Buffer Zone data set

Table 3.4  
Site-Specific Acute Remedial Level Calculation  
DuPont East Chicago Facility

- Assumptions:
- 1) Assumes one time exposure event for a youth trespasser.
  - 2) Although a youth trespasser might also be exposed by soil/skin contact and by inhalation of airborne dust from soil, the magnitude of the soil ingestion exposure far outweighs those other exposures. Therefore, for this acute exposure scenario, only the soil ingestion exposure event is quantified.
  - 3) Because the value is based on a single exposure event, terms related to averaging time and exposure frequency were deleted
  - 4) Where available, reference dose appropriate for acute exposure (less than 14 days duration) were used in the calculation.
  - 5) Assume 100% bioavailability

$$RL_{acute} = \frac{BW \times RfDo}{IRs \times CF}$$

Intake Parameter		Value	Reference
RfDo	Acute Reference Dose - oral (mg/kg-day)	Chemical-Specific	
IRs	Ingestion Rate, soil (mg/day)	100	USEPA recommended value for youth age 7-16 years (USEPA, 1997)
CF	Conversion Factor, soil (kg/mg)	1E-06	
BW	Body Weight (kg)	45	USEPA recommended value for youth age 7-16 years (USEPA Region IV, 2000)

Constituent	RfDo mg/kg-day	Source	RL <sub>acute</sub> mg/kg	Source Notes:
Antimony	5.00E-02	Derived	2.25E+04	LOAEL of 0.5 mg/kg in humans (IRIS, ATSDR) with an applied UF of 10 to account for sensitive populations. Endpoint of gastrointestinal distress.
Arsenic	5.00E-03	ATSDR	2.25E+03	MRL for acute exposures
Cadmium	5.00E-02	FDEP	2.25E+04	FDEP Derived RfD for acute exposures. Based on a LOAEL of 0.05 mg/kg with an endpoint of gastrointestinal distress in humans.
Iron	3.00E-01	NCEA	1.35E+05	Based on recommended daily allowance. Value cited in USEPA Region IX PRG Table.
Manganese	1.40E-01	IRIS	6.30E+04	Based on NRC value of 10 mg/day, considered safe for occasional intake
Zinc	3.00E-01	IRIS	1.35E+05	Subchronic RfD

RL<sub>acute</sub> = Remedial level for an acute endpoint (mg/kg)

**References:**

- Agency for Toxic Substances and Disease Registry (ATSDR), 1992. Toxicological Profile for Antimony and Compounds. PB/93/110641/AS. September.
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- USEPA, 2006. Integrated Risk Information System. [On-Line]. Available: <http://www.epa.gov/ngispgm3/iris/irisdat/>
- USEPA Region IV, 2000. Supplemental Guidance to RAGs: Region IV Bulletins. Office of Technical Services. May.
- USEPA Region IX, 2004. Preliminary Remediation Goal Table. November.

Table 3.5  
Site-Specific Acute Remedial Level for Lead  
DuPont East Chicago Facility

**Objective:** Calculate a weighted average that reflects the fraction of each year during which a youth trespasser is exposed to soil and dust with different lead concentrations.

**Where:**

$$C_{total} = (C_{tres} * EF_{tres} + C_{res} * EF_{res}) / 365 \quad (\text{Equation 1})$$

**Rearranging to solve for C<sub>tres</sub>:**

$$C_{tres} = ((C_{total} * 365) - (C_{res} * EF_{res})) / EF_{tres} \quad (\text{Equation 2})$$

Variable	Description	Value	Source
C <sub>total</sub>	Residential acceptable soil lead level (child exposure), mg/kg	400	USEPA value, Will not exceed a 5% risk of exceeding blood lead level of 10 ug/dl
C <sub>tres</sub>	Trespasser soil level (child exposure), mg/kg	Calculated	
C <sub>res</sub>	Lead level in presumed backyard, mg/kg	200	Default Soil/Dust Concentration, IEUBK Model
EF <sub>tres</sub>	Exposure frequency at site, day/yr	5	Conservative site-specific estimate of exposure during warm weather months (1 day per month for five months)
EF <sub>res</sub>	Exposure frequency at presumed backyard, day/yr	145	150 d/yr - EF <sub>tres</sub> ; Averaging over exposure season (five months)

**Using Equation 2:**

$$C_{tres} = 6200 \text{ mg/kg}$$

*Assessing Intermittent or Variable Exposures at Lead Sites (OSWER 9285.7-76, November 2003)*

Table 3.6  
Concentrations in Surface Soil (0-2') Compared to Acute Remedial Levels  
DuPont East Chicago Facility

Analyte	Acute Remedial Level (mg/kg)	Max Detect (mg/kg)	Unit	Location	Exceeds?
Antimony	22,500	7,360	SWMU 10D	ECH-S-S10D-01S(0-2)	No
Arsenic	2,250	99,400	SWMU 4	ECH-S-S4-02S(0-2)	Yes
Cadmium	22,500	5,930	SWMU 10D	ECH-S-RFI2-S10D-4(0-2)	No
Iron	135,000	238,000	AOC 12	ECH-S-BERA-RNOF05-01(0-1)	Yes
Manganese	63,000	14,800	AOC 2E	ECH-S-RFI2-A2E-1(0-2)	No
Zinc	135,000	130,000	SWMU 7	ECH-S-S7-01S(0-2)-DUP	No
Lead	6,200	147,000	SWMU 10B	ECH-S-BERA-S10B-01(0-1)	Yes

Table 3.7A  
Summary of Units with Locations Above Acute Remedial Levels  
DuPont East Chicago Facility

Arsenic			Iron			Lead		
Unit	No. Samples	No. Samples Above RL	Unit	No. Samples	No. Samples Above RL	Unit	No. Samples	No. Samples Above RL
AOC 2E	7	2	AOC 13	5	2	AOC 12	9	2
SWMU 14	3	2	SWMU 21	4	3	AOC 13	10	7
SWMU 1A	9	1	SWMU 7	4	1	AOC 2E	7	1
SWMU 1J	9	2	AOC 12	9	1	AOC 6	7	5
SWMU 4	9	2				SWMU 10B	2	2
						SWMU 10D	5	1
						SWMU 1A	9	5
						SWMU 1I	4	3
						SWMU 1J	9	6
						SWMU 3	9	1
						SWMU 4	9	5
						SWMU 7	9	9

RL - Acute Remedial Level as defined in Table 4

Table 3.7B  
Summary of Boring Locations Above Acute Remedial Levels  
DuPont East Chicago Facility

Unit	Location	Arsenic	Iron	Lead
SWMU 1A	ECH-S-RF12-S1A-2(0-1.5)			X
SWMU 1A	ECH-S-RF12-S1A-2(1-1.5)-DUP			X
SWMU 1A	ECH-S-RF12-S1A-3(0-1)			X
SWMU 1A	ECH-S-RF12-S1A-4(0-1)			X
SWMU 1A	ECH-S-RF12-S1A-8(0-1.5)	X		X
SWMU 1I	ECH-S-RF12-S1I-1(0-1.25)			X
SWMU 1I	ECH-S-RF12-S1I-2(0-1.5)			X
SWMU 1I	ECH-S-RF12-S1I-3(0-1.5)			X
SWMU 1J	ECH-E-S1J-02S(0-2)			X
SWMU 1J	ECH-E-S1J-03S(0-2)			X
SWMU 1J	ECH-E-S1J-03S(0-2)-DUP			X
SWMU 1J	ECH-E-S1J-04S(0-2)			X
SWMU 1J	ECH-S-RF12-S1J-1(0-2)	X		X
SWMU 1J	ECH-S-RF12-S1J-2(0-2)			X
SWMU 1J	ECH-S-RF12-S1J-4(0-2)	X		X
SWMU 3	ECH-S-RF12-S3-4(0-2)			X
SWMU 4	ECH-S-RF12-S4-2(0-2)			X
SWMU 4	ECH-S-RF12-S4-4(0-2)	X		
SWMU 4	ECH-S-S4-02S(0-2)	X		X
SWMU 4	ECH-S-S4-03S(0-2)			X
SWMU 4	ECH-S-S4-03S(0-2)-DUP			X
SWMU 7	ECH-S-RF12-S7-1(0-2)			X
SWMU 7	ECH-S-RF12-S7-2(0-2.5)		X	X
SWMU 7	ECH-S-RF12-S7-3(0-2)			X
SWMU 7	ECH-S-RF12-S7-4(0-2)			X
SWMU 7	ECH-S-S7-01S(0-2)			X
SWMU 7	ECH-S-S7-01S(0-2)-DUP			X
SWMU 7	ECH-S-S7-02S(0-2)			X
SWMU 7	ECH-S-S7-03S(0-2)			X
SWMU 7	ECH-S-S7-04S(0-2)			X
SWMU 10B	ECH-S-BERA-S10B-01(0-1)			X
SWMU 10B	ECH-S-BERA-S10B-01(1-2)			X
SWMU 10D	ECH-S-RF12-S10D-4(0-2)			X
SWMU 14	ECH-S-BERA-S14-01(0-1)	X		
SWMU 14	ECH-S-BERA-S14-02(0-1)	X		
SWMU 21	ECH-S-RF12-S21-2(0-2)		X	
SWMU 21	ECH-S-RF12-S21-3(0-2)		X	
SWMU 21	ECH-S-RF12-S21-4(0-2)		X	
AOC 2E	ECH-S-A2E-03S(0-2)	X		X
AOC 2E	ECH-S-RF12-A2E-3(0-2)	X		
AOC 6	ECH-S-BERA-A6-01(0-1)			X
AOC 6	ECH-S-BERA-A6-02(0-1)			X
AOC 6	ECH-S-BERA-A6-02(1-2)			X
AOC 6	ECH-S-BERA-A6-03(0-1)			X
AOC 6	ECH-S-BERA-A6-03(0-1)-DUP			X
AOC 12	ECH-S-BERA-RNOF05-01(0-1)		X	X
AOC 12	ECH-S-BERA-RNOF05-01(1-2)			X
AOC 13	ECH-S-A13-01S(0-2)			X
AOC 13	ECH-S-A13-01S(0-2)-DUP			X
AOC 13	ECH-S-A13-01U(1-4)			X
AOC 13	ECH-S-A13-03S(0-2)			X
AOC 13	ECH-S-RF12-A13-2(0-2)		X	X
AOC 13	ECH-S-RF12-A13-2(0-2)-DUP		X	X
AOC 13	ECH-S-RF12-A13-4(0-2)			X

Table 7.1  
Comparison of Remedial Alternatives to Selection Criteria  
East Chicago Site

Criteria	Alternative #1  Institutional Controls	Alternative #2 Surface Cover, PRB, Institutional Controls	Alternative #3 Asphalt Cover, PRB, Institutional Controls	Alternative #4 Excavation, PRB, Institutional Controls	Alternative #5 Insitu Stabilization, PRB, Institutional Controls	Alternative #6 PRB, Institutional Controls
<b>Threshold Criteria</b>						
Overall Protection of Human Health Attainment of Media Cleanup Standards		X	X	X	X	
Source Control				X#	X#	
Compliance with Applicable Standards for Waste Management	X	X	X	X	X	x
<b>Balancing Criteria</b>						
Long-term Reliability and Effectiveness		X	X	X	X	X
Reduction of Toxicity, Mobility, and Volume of Wastes		X&	X&	X	X	X&
Short-term Effectiveness	X	X	X	X	X	X
Implementability	X	X	X	X	X	X
Present Cost (MM/30 yr)	\$0.43	\$5.3 (SC) to 6.36 (GC)	\$8.83	\$23.98	\$9.26	\$2.52

X Addresses selection criteria

\* Addresses media cleanup standards in only ground water

& Meets Reduction of toxicity mobility or volume criteria in only ground water, or partially in soil.

# Source control for a portion of the waste on site

Selected Alternative

**Table 7.2**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations	Ecological Activities	CMS Activities
SWMU 1A	Ash Landfill/Stoker Grate Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	Potential migration of constituent to groundwater south of PRB addressed by PRB. SWMU north of PRB to be addressed in CMS.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address human health and GW migration concerns	Further evaluation of residual ecological risks. Possible additional sampling.	Groundwater treatment & institutional and engineering controls for Human Health
SWMU 1B	Calcium Sulfate and TSP Area	NFA-HH	Surf soils a potential ecological concern	NFA (Phase I).	<b>BERA</b> to address Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
SWMU 1C	Rubble Fill Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	NFA: Phase II RFI indicated that constituents in soil that exceeded the regulatory potential migration number were not detected at concentrations of interest in groundwater; therefore potential for release to GW is low.	<b>BERA</b> to address Eco concerns. Subsequent <b>CMS</b> will be performed to address HH BLRA.	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health
SWMU 1H	PCB Storage Area in Rubble Fill Area	NFA-HH	NFA	NFA (Phase I).	Include in <b>BERA</b> with SWMU 1C	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
SWMU 1I	Miscellaneous Pits and Piles—North	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	Potential migration of constituent to groundwater south of PRB addressed by PRB. SWMU north of PRB to be addressed in CMS.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address human health and GW migration concerns	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health
SWMU 1J	Miscellaneous Pits and Piles—South	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	CMS recommended - potential for release to groundwater.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address human health and GW concerns.	<b>No further evaluation</b> of ecological risks; Human Health remedy will protect ecological receptors.	Groundwater treatment and institutional and engineering controls for Human Health
SWMU 1K	Spill Areas—South of Ash Landfill/Stoker Grate Area	NFA-HH	NFA	NFA: (Phase I).	Include in <b>BERA</b> and Risk Management with SWMU 1A	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
SWMU 2B							
SWMU 2C	East Pile	NFA-HH	Surf soils a potential ecological concern	NFA: GW not a concern based soil constituents and nearby well results (Phase II).	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
SWMU 2D	Far East Pile	NFA-HH	Collect surf soil samples and assess potential for ecological concern.	NFA: (Phase I).	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health

**Table 7.2**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations	Ecological Activities	CMS Activities
SWMU 3	Disposal Area Near Former Chrome Outfall	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	Constituent migration to GW a potential concern.	A <b>limited GW study</b> will be performed to address potential migration concern. A <b>CMS</b> will be performed to address HHBLRA.	Further evaluation of residual ecological risks. Possible additional sampling.	Groundwater treatment & institutional and engineering controls for Human Health
SWMU 4	Insecticide Disposal Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern.	CMS recommended - potential for release to groundwater.	A <b>CMS</b> will be performed to address HH and GW migration concerns.	Further evaluation of residual ecological risks. Possible additional sampling.	Groundwater treatment & institutional and engineering controls for Human Health
SWMU 5	PCB Electrical Storage Yard	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I).	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
SWMU 6A	Waste Solvent Tank	Dismissed - No COPCs or complete pathways identified.	NFA	NFA: (Phase I).	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
SWMU 6E	Flue Dust Storage near North Warehouse	Dismissed - No COPCs or complete pathways identified.	NFA	NFA: (Phase I).	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
SWMU 7	Abandoned Chemical Storage Building-"The Morgue"	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern.	Constituent migration to GW a potential concern.	A <b>limited GW study</b> will be performed to address potential migration concern. A <b>CMS</b> will be performed to address HHBLRA.	<b>No further evaluation</b> of ecological risks; Human Health remedy will protect ecological receptors.	Groundwater treatment & institutional and engineering controls for Human Health
SWMU 8	Zinc Roaster Sinter Area	NFA-HH	Surf soils a potential ecological concern.	NFA:(Phase I)	<b>BERA</b> to assess ecological concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action Recommended</b> for Ground Water or Human Health
SWMU 10A	North Pit	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	NFA:(Phase I)	A <b>CMS</b> will be performed to address HHBLRA concerns. <b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health
SWMU 10B	West Pit	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern. Collect surf soil samples and assess potential for ecological concern.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.	Further evaluation of residual ecological risks. Possible additional sampling.	Groundwater treatment & institutional and engineering controls for Human Health

**Table 7.2**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations	Ecological Activities	CMS Activities
SWMU 10C	South Pit	NFA-HH	Collect surf soil samples and assess potential for ecological concern.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
SWMU 10D	Far North Pit	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	NFA:Subsurf soil conc similar to just slightly higher than reg value for migration to GW. NFA recommended for GW (Phase II).	A <b>CMS</b> will be performed to address HHBLRA and Eco concerns	Further evaluation of residual ecological risks. Possible additional sampling.	Groundwater treatment & institutional and engineering controls for Human Health
SWMU 11	Sulfamic Acid Pits (2)	NFA-HH	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
SWMU 12A	North Basin	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	NFA if SWMU filled-in	Sediment conc exceed reg value for migration to GW (Phase II).	A <b>CMS</b> will be performed to address HHBLRA and RFI concerns	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health
SWMU 12B	South Basin	NFA-HH	Potential surf soil ecological concern. Ecological concerns to be addressed in BERA.	CMS - Potential for release to GW based on concentrations and location to HCL spill (Phase II).	A <b>CMS</b> will be performed to address RFI concerns	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health
SWMU 14	Chrome Outfall and Impoundment	NFA-HH	Collect surf soil samples and assess potential for ecological concern.	CMS: A single subsurface soil sample exceeded regulatory potential migration values by approx 6 times.	<b>BERA</b> to be performed. Subsequent <b>CMS</b> to address GW migration potential and, if applicable, eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health
SWMU 15	Former Wastewater Treatment System (Outfall 002)	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
SWMU 17B	Process Sewers	NFA-Phase1	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
SWMU 20	I-90 Fill Area	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
SWMU 21	Lead Arsenate Sludge Disposal Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed in the BERA.	Potential for release to GW based on Phase II assessment.	A <b>CMS</b> will be performed to address HHBLRA, RFI concerns	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health

**Table 7.2**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations	Ecological Activities	CMS Activities
AOC 1C	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 1D	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action</b> Recommended
AOC 1E	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action</b> Recommended
AOC 1F	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 1G	Vehicle Loading/ Unloading Areas	Dismissed - No COPCs or complete pathways identified.	NFA	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>NFA: (Phase II)</b>		<b>No Further Action</b> Recommended
AOC 2A	Railroad Loading and Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 2B		NFA-HH	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health

**Table 7.2**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations	Ecological Activities	CMS Activities
AOC 2C	Railroad Loading and Unloading Areas	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 2D		Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 2E		Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Potential surf soil ecological concern. Ecological concerns to be addressed through a BERA.	Potential for release to GW based on Phase II assessment.	A <b>CMS</b> will be performed to address HHBLRA, RFI, and Eco concerns	Further evaluation of residual ecological risks. Possible additional sampling.	Groundwater treatment & institutional and engineering controls for Human Health
AOC 2F		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>No Further Action Recommended</b>		<b>No Further Action Recommended</b>
AOC 3A1	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	Potential surf soil ecological concern. Ecological concerns to be addressed through a BERA.	CMS - Potential for release to GW based on concentrations and location to HCL spill (Phase II).	A <b>CMS</b> will be performed to address RFI and Eco concerns	Further evaluation of ecological risks. Possible additional sampling.	Groundwater treatment and institutional controls for Human Health
AOC 3A2		Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	<b>BERA</b> to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action Recommended for Ground Water or Human Health</b>
AOC 3B	Aboveground Storage Tanks	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
AOC 3C1		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
AOC 3C2	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
AOC 3D		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>

**Table 7.2**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations	Ecological Activities	CMS Activities
AOC 3E	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA:(Phase I)	BERA to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 3H	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	BERA to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 3I		Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	NFA: (Phase II)		<b>No Further Action</b> Recommended
AOC 3J	Aboveground Storage Tanks	Dismissed - No COPCs or complete pathways identified.	NFA	NFA:(Phase I)	NFA: (Phase II)		<b>No Further Action</b> Recommended
AOC 5	Beneath Former Contact No.1	Dismissed - No COPCs or complete pathways identified.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Phase II assessment of potential migration of constituent to GW determined that no risk based GW values apply to sulfate; the only constituent with soil concentrations of interest. Therefore no potential for sulfate in GW to be of concern.	BERA to assess Eco concerns.	Further evaluation of ecological risks. Possible additional sampling.	<b>No Further Action</b> Recommended for Ground Water or Human Health
AOC 6	Zinc Crude Milling Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern. Ecological concerns to be addressed through a BERA.	NFA: Low to No potential for concerns pertaining to air, DC, GW, and run-off (Phase I).	BERA to assess Eco concerns.	<b>No further evaluation</b> of ecological risks; Human Health remedy will protect ecological receptors.	Institutional and engineering controls for Human Health
AOC 8	Former Powerhouse Pit	NFA-HH	NFA	NFA:(Phase I)	NFA: (Phase II)		<b>No Further Action</b> Recommended
AOC 11	Ditch and Associated Materials	NFA-HH	NFA	NFA:(Phase I)	NFA: (Phase II)		<b>No Further Action</b> Recommended
AOC 12	Area East of Freon Area South of ASTs	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Collect surf soil samples and assess potential for ecological concern.	NFA:(Phase I)	BERA to address Eco concerns.	Further evaluation of residual ecological risks. Possible additional sampling.	Institutional and engineering controls for Human Health

**Table 7.2**  
**Review of Assessments and Resulting Path Forward**

Unit	Name	HH BLRA Assessment	SLERA Assessment	GW Migration Assessment	RFI Phase II Recommendations	Ecological Activities	CMS Activities
AOC 13	Conoco Area	Potential contact concern for future site manufacturers and construction workers. Air not a concern.	Surf soils a potential ecological concern	NFA: Potential for migration of constituents to GW not a concern based on comparison of soil results to near by monitor well results.	<b>BERA</b> to assess Eco concerns. Subsequent <b>CMS</b> to address HH concerns and, if applicable, Eco concern.	Further evaluation of residual ecological risks. Possible additional sampling.	Groundwater treatment & institutional and engineering controls for Human Health
AOC 14	Former Insecticides Warehouse	NFA-HH	NFA	NFA:(Phase I)	<b>NFA: (Phase II)</b>		<b>No Further Action Recommended</b>
AOC GW A	Pool A Groundwater	Potential ingestion concern for future site manufacturers and construction workers. Air not a concern.	Not Applicable	GW migrating north to residential area is being treated by PRB. Long term monitoring is being performed to understand impact of SWMUs/AOCs on GW.	<b>Long Term GW Monitoring and Deed Restriction</b> to prevent ingestion by future site manufacturing and construction workers.		Groundwater treatment and institutional controls for Human Health
AOC GW B	Pool B Groundwater	Potential ingestion concern for future site manufacturers and construction workers. Air not a concern.	Not Applicable	GW migrates to East Branch of Grand Calumet River. Phase I RFI concluded that surface waters were not adversely impacted by groundwater discharges. Long term monitoring is being performed to understand impact of SWMUs/AOCs on GW.	<b>Long Term GW Monitoring and Deed Restriction</b> to prevent ingestion by future site manufacturing and construction workers.		Groundwater treatment and institutional controls for protection of Ecological Receptors

HH = Human Health Baseline Risk Assessment

Eco = Ecological Risk Assessment

Phase I = DuPont Phase I RFI

Phase II = DuPont Phase II RFI

DC = Direct Contact

air = Release to Air

GW = Migration to Groundwater

Runoff = Surface water runoff

BERA = Baseline Environmental Risk Assessment

BERA-SS = BERA with surficial soil sampling

HHBLRA = Human Health Base Line Risk Assessment

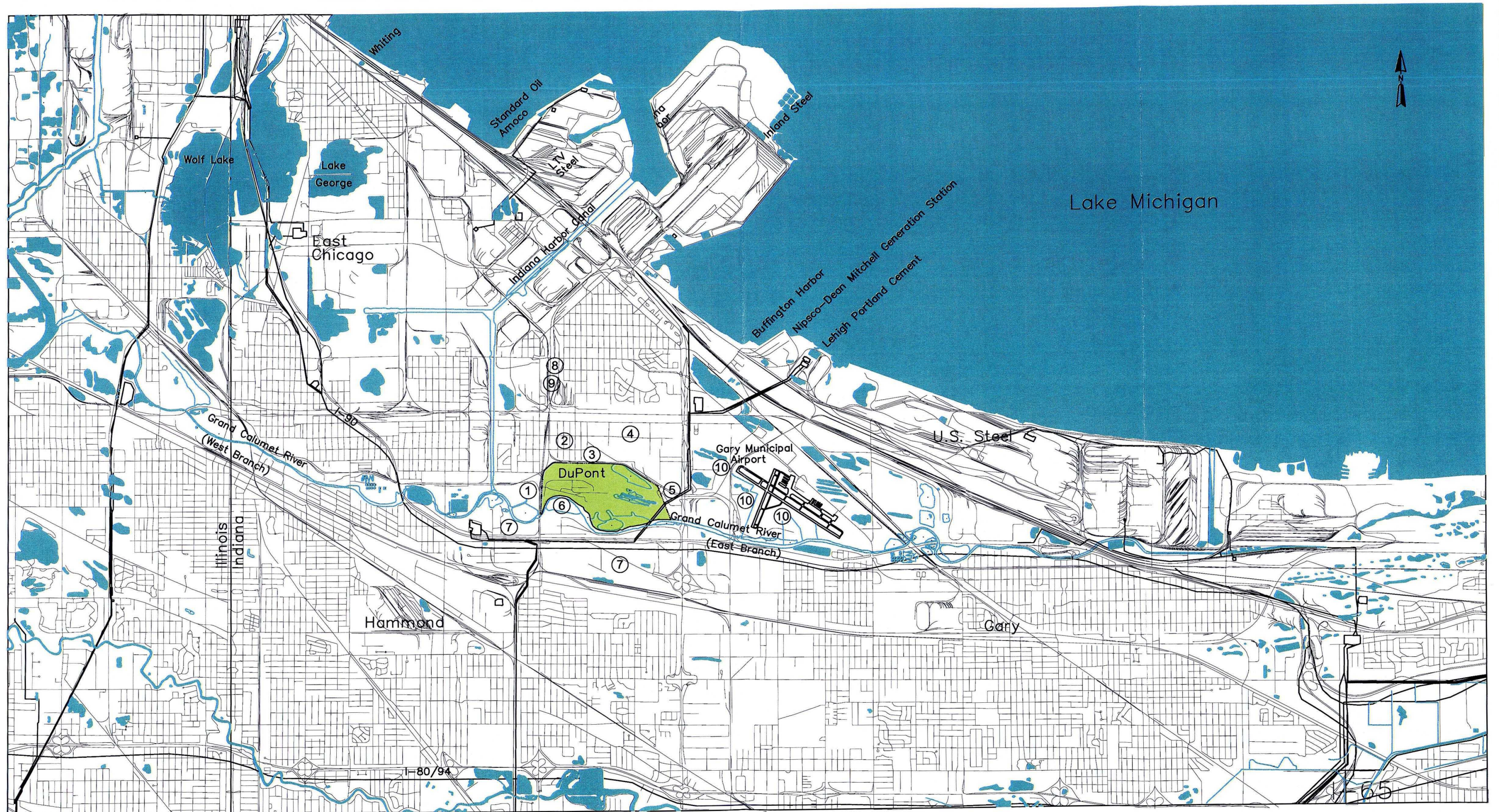
CMS = Corrective Measures Study

RFI = RCRA Facility Investigation

RCRA = Resource Conservation Recovery Act

NFA = No Further Action

## FIGURES



**Legend**  
 DuPont Property Line

**Sources:**  
 USGS Digital Line Graphs 1:100,000  
 USGS Land Use  
 Land Cover 1:250,000  
 Universal Transverse Mercator Projection,  
 Zone 16, 1983 North American Datum.

- |   |                                |
|---|--------------------------------|
| ① USS Lead Refinery                         | ⑥ Harbison-Walker Refractories |
| ② Riley Park                                | ⑦ Shell Oil Company            |
| ③ Salvage Yard & G C Trucking               | ⑧ Robinson Steel               |
| ④ Standard Oil Refinery                     | ⑨ Marport Smelting             |
| ⑤ East Chicago Solid Waste Transfer Station | ⑩ Former Nike Missile Base     |

0 2640 5280  
 FEET

DESIGNED	INITIALS
A. BAINES	
DRAWN	
D.H. ENGLISH	
CHECKED	
A. BAINES	
APPROVED(DESIGN)	
APPROVED(CONSTRUCTION)	

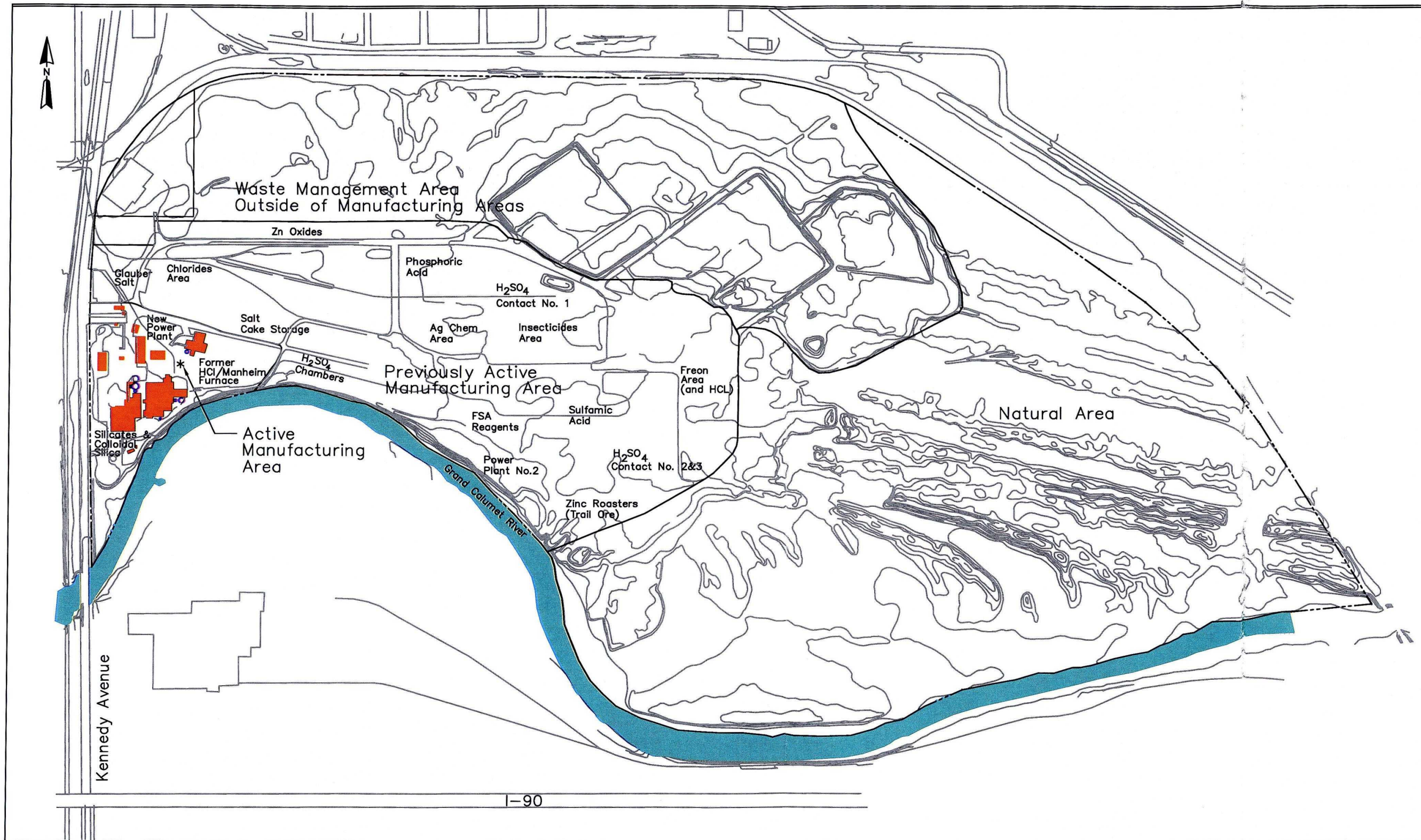
**DU PONT**  
 Corporate Remediation Group  
*An Alliance between  
 DuPont and URS Diamond*

Barley Mill Plaza, Building 19  
 Wilmington, Delaware 19805

**SITE LOCATION MAP**

DuPont East Chicago Facility  
 East Chicago, Indiana

SCALE 1" = 1 MILE	DATE 10-30-2006	CDR FILE NO. FIG. 2.1	FIGURE 2.1
----------------------	--------------------	--------------------------	---------------



#### Legend

- DuPont Property Line
- Contours - 2ft Interval
- Area Boundaries
- Silicates and Colloidal Silica

#### Sources:

Plant Drawings

#### SCALE



DESIGNED	INITIALS
A. BAINES	
DRAWN	
D.H. ENGLISH	
CHECKED	
A. BAINES	
APPROVED(DESIGN)	
APPROVED(CONSTRUCTION)	



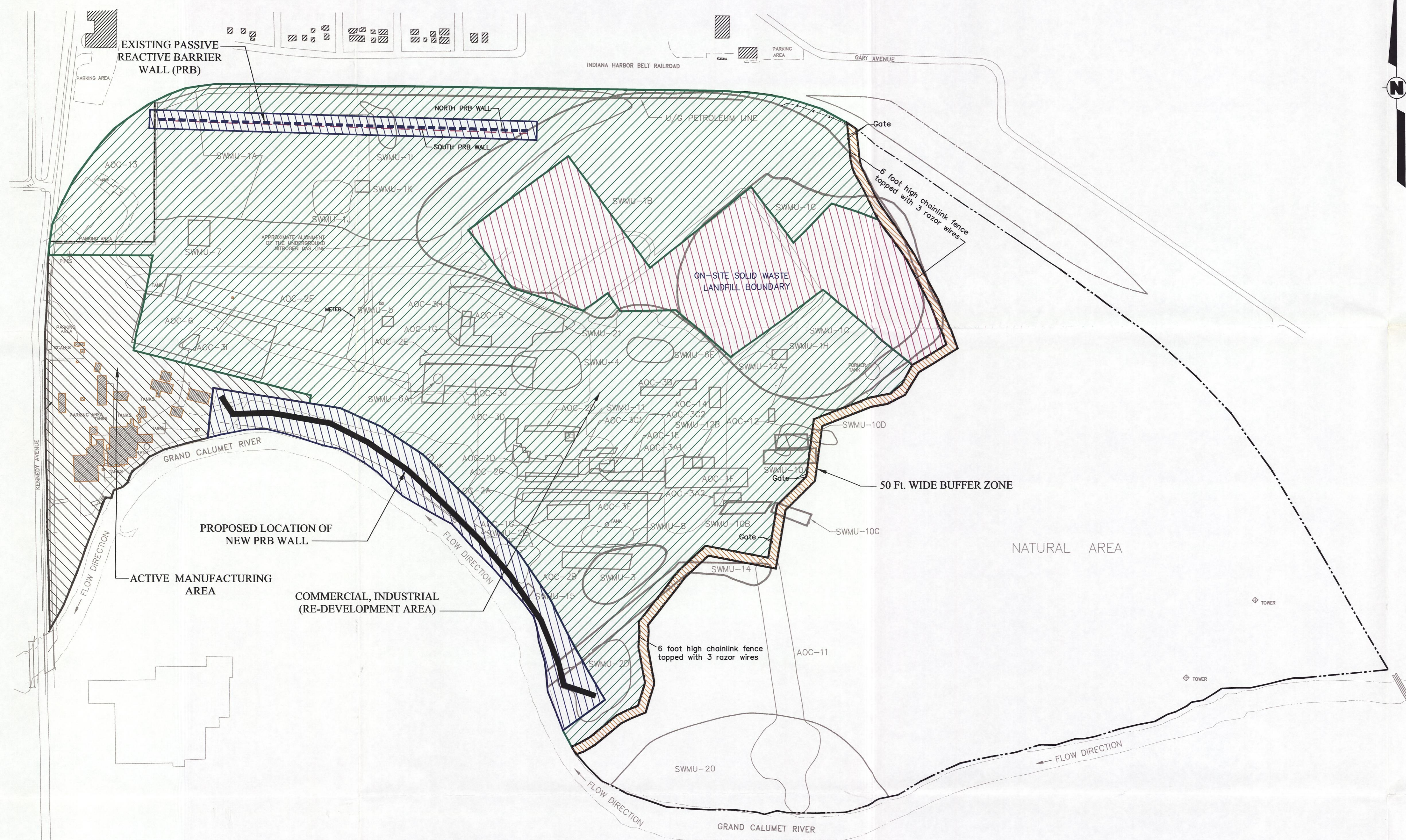
Corporate Remediation Group  
An Alliance between  
DuPont and URS Diamond

Barley Mill Plaza, Building 19  
Wilmington, Delaware 19805

#### SITE MAP

DuPont East Chicago Facility  
East Chicago, Indiana

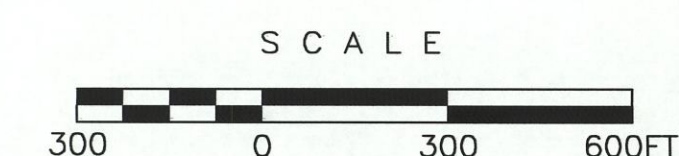
SCALE	DATE	CD FILE NO.	FIGURE
1" = 600'	10-30-2006	FIG. 2.2	2.2



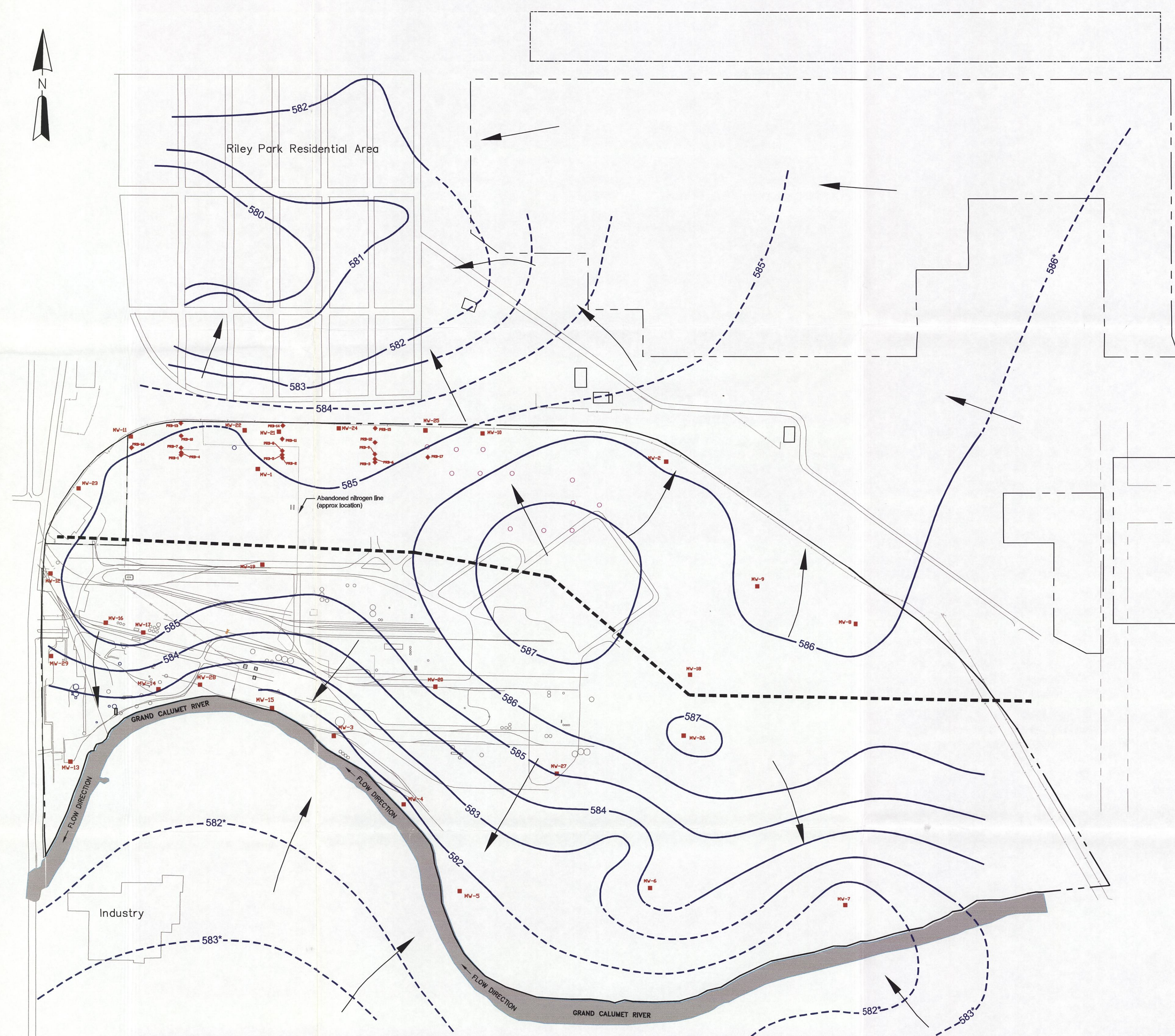
Sources:  
DuPont and CH2M HILL

Legend

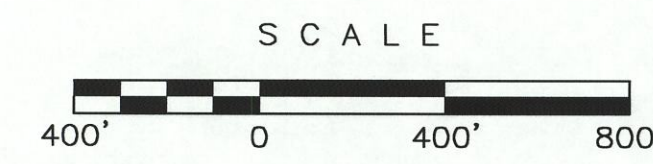
- Areas of Concern
- Solid Waste Management Units
- DuPont Property Line
- Proposed PRB Wall
- Existing PRB Wall North
- Existing PRB Wall South
- Deed Restricted - Groundwater Treatment System
- Deed Restricted Area - Solid Waste Landfill
- Commercial, Industrial (Re-Development Area)
- Active Manufacturing Area (Grace)
- Natural Area Buffer Zone





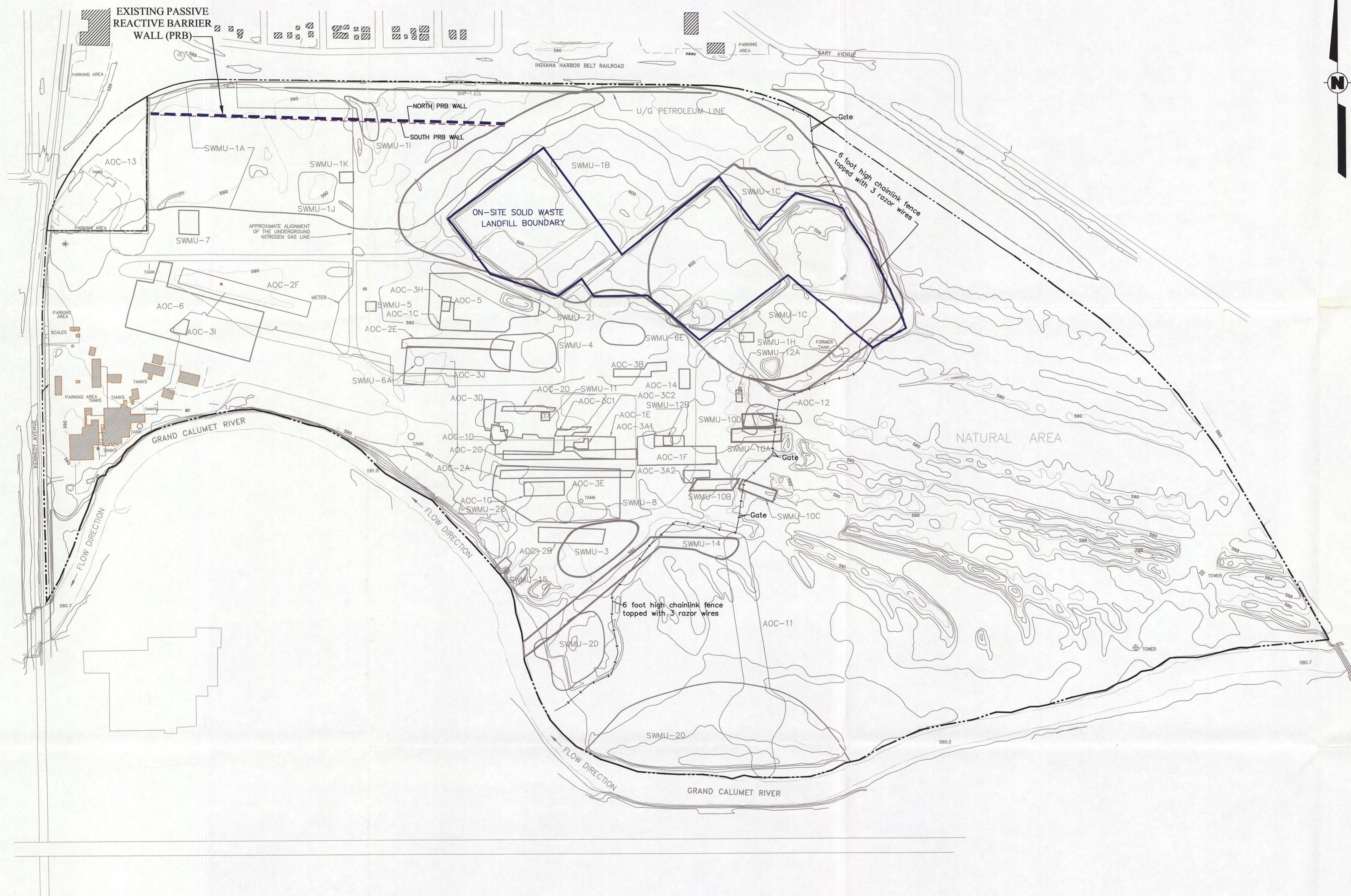
DESIGNED A. BAINES	INITIALS	 Corporate Remediation Group An Alliance between DuPont and URS Diamond	FUTURE LAND USE			
DRAWN D.H. ENGLISH			DuPont East Chicago Facility			
CHECKED A. BAINES			East Chicago, Indiana			
APPROVED(DESIGN)						
APPROVED(CONSTRUCTION)		Barley Mill Plaza, Building 19 Wilmington, Delaware 19805	SCALE 1" = 300'	DATE 10-30-2006	CAD FILE NO. FIG. 2.3	FIGURE 2.3



- LEGEND**
- DuPont Property Line
  - GROUNDWATER DIVIDE
  - MONITORING WELL LOCATION
  - ◆ PRB WELL LOCATION
  - 583 --- GROUNDWATER CONTOUR WITH ELEVATION
  - 583\* --- GROUNDWATER CONTOUR ELEVATIONS ARE INFERRED BASED ON SIX USGS GROUNDWATER STUDIES PERFORMED IN THE EAST CHICAGO AREA. THE USGS STUDIES PRODUCED TEN (10) GROUNDWATER FLOW FIGURES FOR THE FOLLOWING MONTHS: 03/86, 05/86, 09/86, 07/88, 08/88, 02/90, 11/90, 06/92, 09/92, AND 07/97 THROUGH 02/2001.
  - GROUNDWATER FLOW DIRECTION
  - GRAND CALUMET FLOW DIRECTION



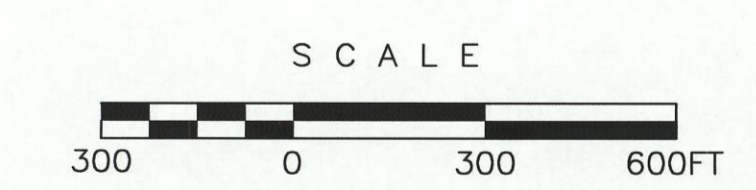
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DRAWN D.H. ENGLISH			
CHECKED S. KUMAR			
APPROVED(DESIGN)			
APPROVED(CONSTRUCTION)		 <b>Corporate Remediation Group</b> <i>An Alliance between DuPont and URS Diamond</i>	
Barley Mill Plaza, Building 19 Wilmington, Delaware 19805		<b>DuPont East Chicago Facility</b> East Chicago, Indiana	
SCALE 1" = 400'	DATE 10-30-2006	CAD FILE NO. FIG. 2.4	FIGURE 2.4




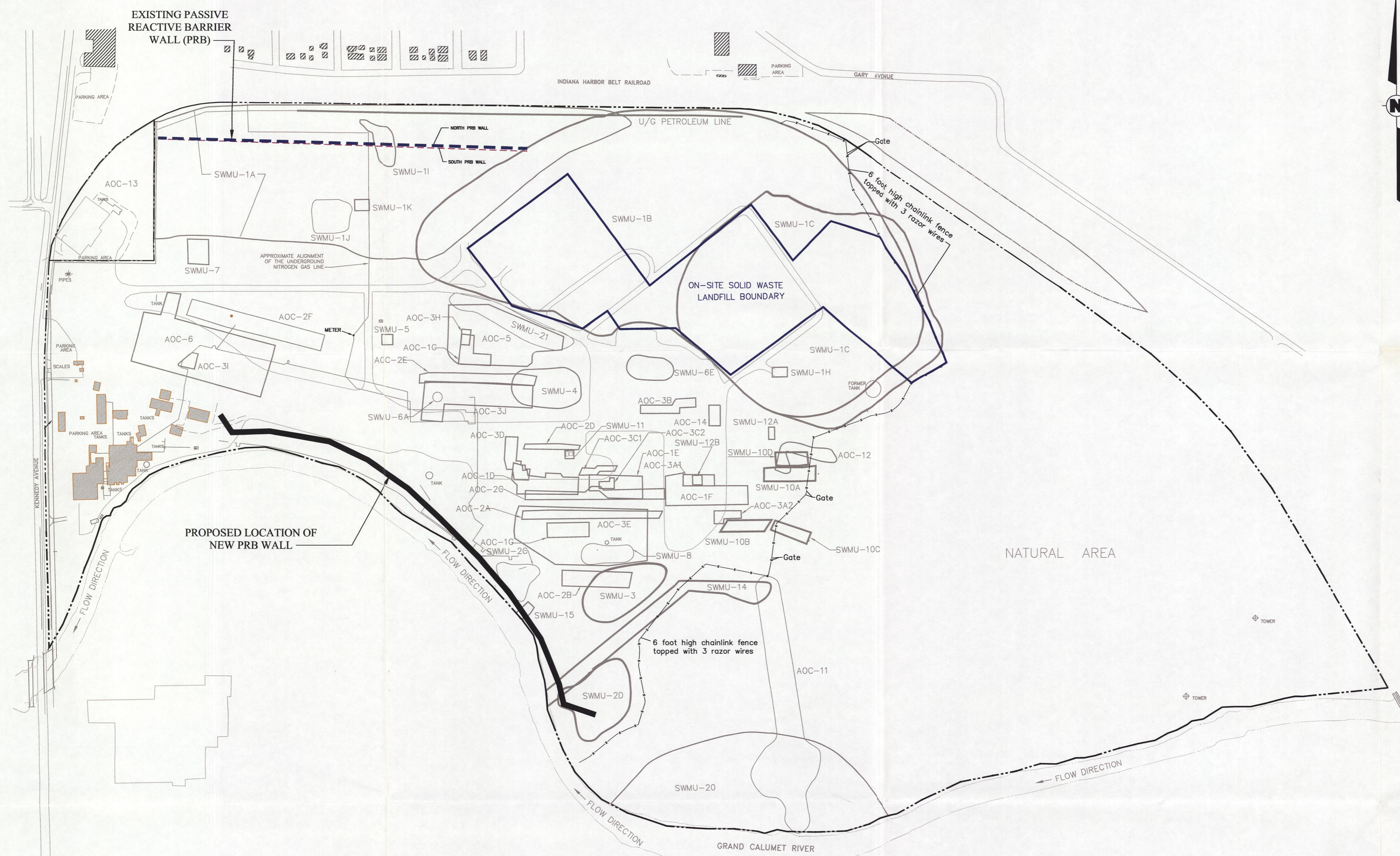
Sources:  
DuPont and CH2M HILL

Legend

- Areas of Concern
- Solid Waste Management Units
- DuPont Property Line
- Existing PRB Wall North
- Existing PRB Wall South
- Solid Waste Landfill Boundary



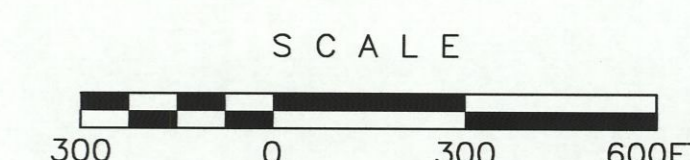
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DRAWN D.H. ENGLISH			East Chicago Facility		
CHECKED A. BAINES			East Chicago, Indiana		
APPROVED(DESIGN)					
APPROVED(CONSTRUCTION)					
		Barley Mill Plaza, Building 19 Wilmington, Delaware 19805	SCALE 1" = 300'	DATE 10-30-2006	CAD FILE NO. FIG. 2.5
					FIGURE 2.5



Sources:  
DuPont and CH2M HILL

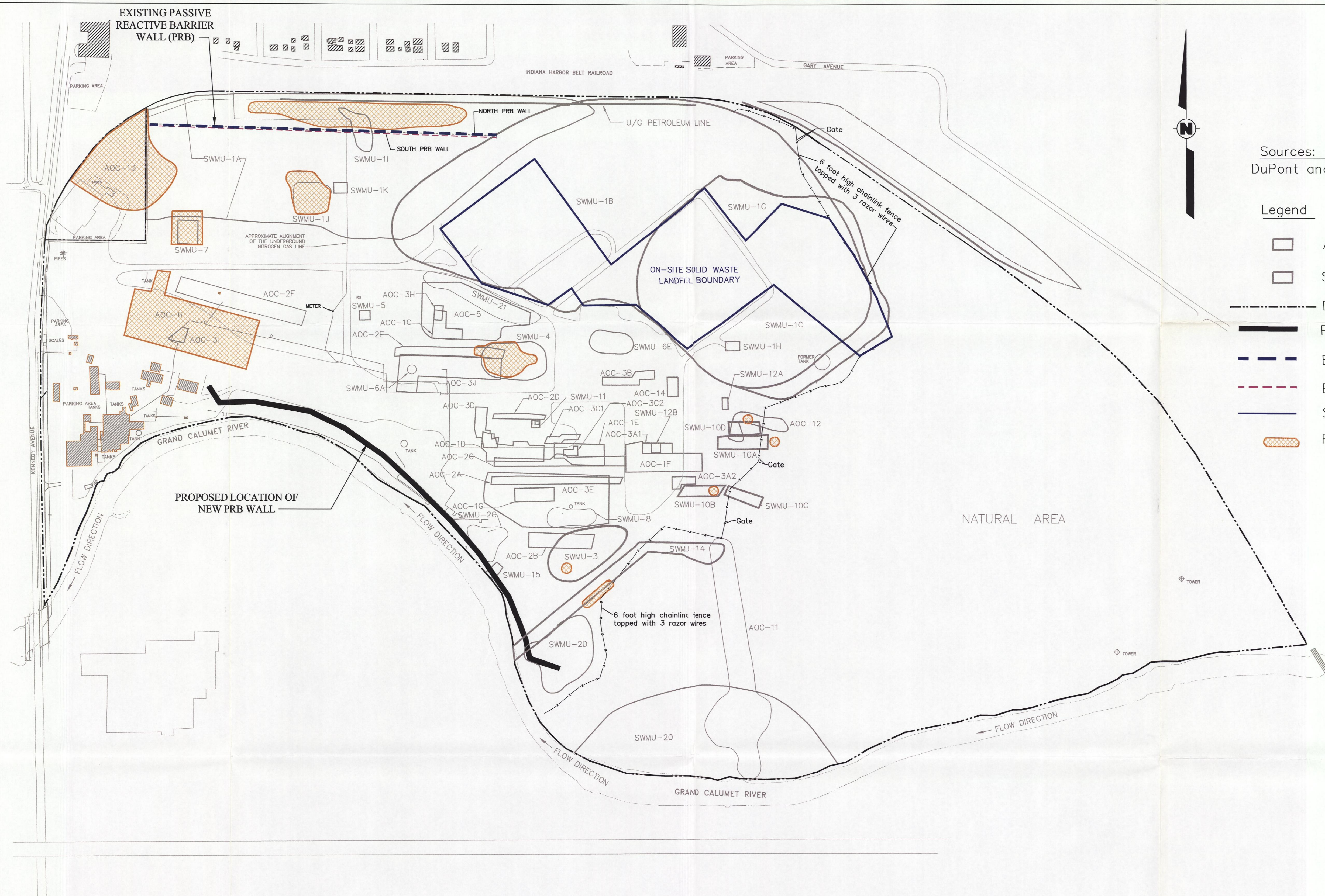
#### Legend

- Areas of Concern
- Solid Waste Management Units
- DuPont Property Line
- Proposed PRB Wall
- Existing PRB Wall North
- Existing PRB Wall South
- Solid Waste Landfill Boundary



DESIGNED A. BAINES	INITIALS	  Corporate Remediation Group <i>An Alliance between</i> DuPont and URS Diamond	<b>AOCs and SWMUs CONSIDERED IN CMS</b>			
DRAWN D.H. ENGLISH			DuPont East Chicago Facility East Chicago, Indiana			
CHECKED A. BAINES			SCALE 1" = 300'	DATE 10-30-2006	CAD FILE NO. FIG. 3.1	FIGURE 3.1
APPROVED(DESIGN)						
APPROVED(CONSTRUCTION)						

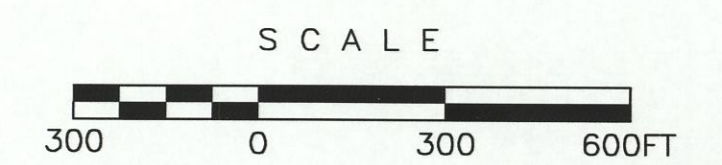
Barley Mill Plaza, Building 19  
Wilmington, Delaware 19805




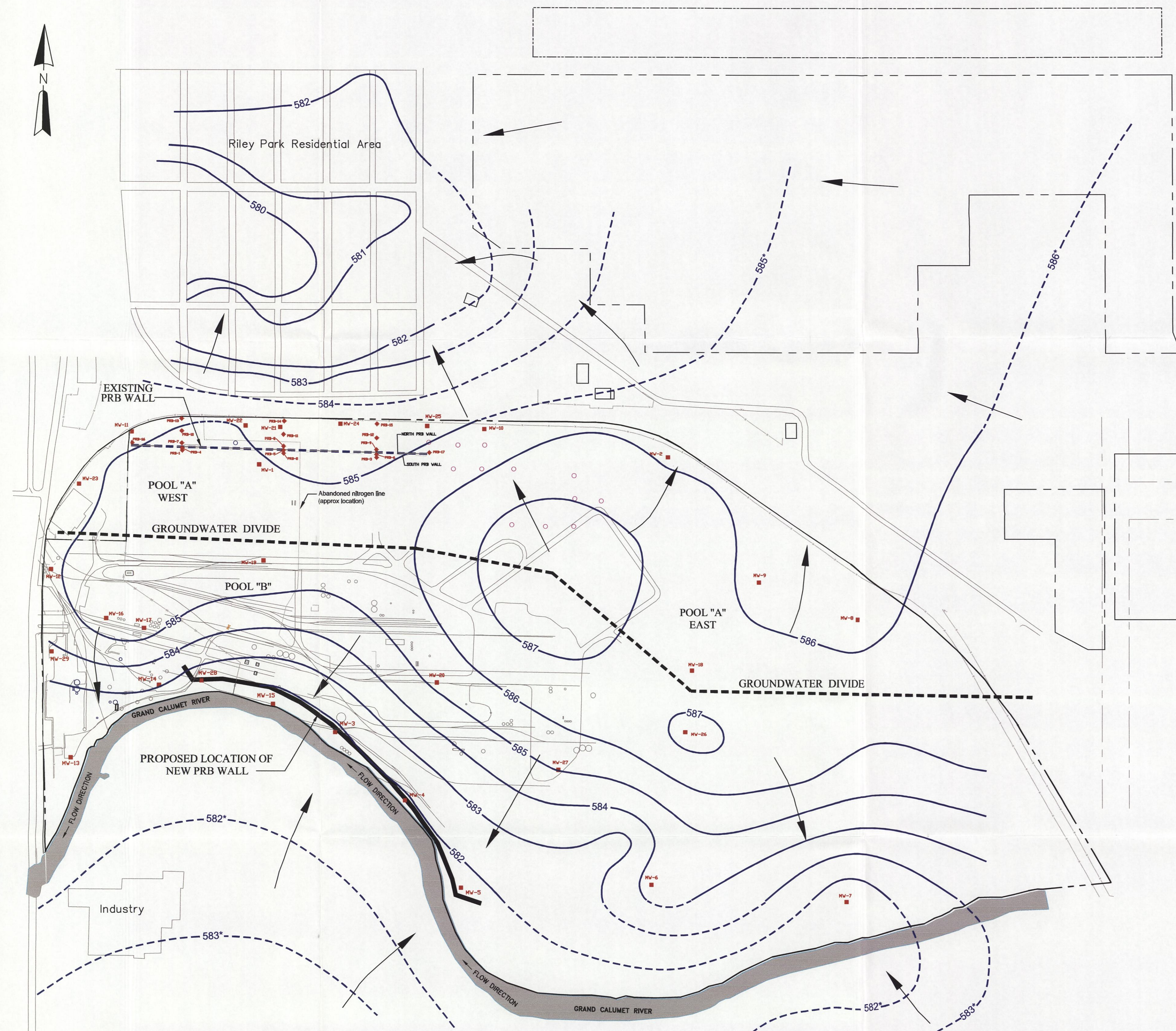
Sources:  
DuPont and CH2M HILL

Legend

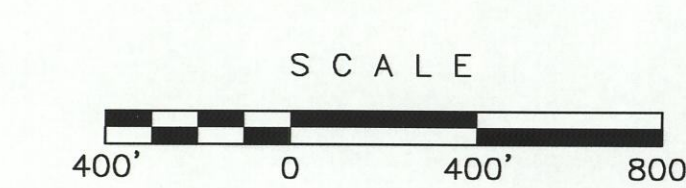
- Areas of Concern
- Solid Waste Management Units
- DuPont Property Line
- Proposed PRB Wall
- Existing PRB Wall North
- Existing PRB Wall South
- Solid Waste Landfill Boundary
- Remedial Measure Boundary



DESIGNED	INITIALS	<div></div> <div>Corporate Remediation Group</div> <div><i>An Alliance between</i></div> <div><i>DuPont and URS Diamond</i></div> <div>Barley Mill Plaza, Building 19</div> <div>Wilmington, Delaware 19805</div>	REMEDIAL MEASURE LOCATIONS			
A. BAINES			DuPont East Chicago Facility East Chicago, Indiana			
DRAWN						
D.H. ENGLISH						
CHECKED						
A. BAINES			SCALE	DATE	CAD FILE NO.	FIGURE
APPROVED(DESIGN)						
APPROVED(CONSTRUCTION)			1" = 300'	10-30-2006	FIG. 3.2	3.2



- LEGEND**
- DuPont Property Line
  - PRB WALL
  - PROPOSED PRB WALL
  - GROUNDWATER DIVIDE
  - MONITORING WELL LOCATION
  - ◆ PRB WELL LOCATION
  - 583 --- GROUNDWATER CONTOUR WITH ELEVATION
  - 583\* --- GROUNDWATER CONTOUR ELEVATIONS ARE INFERRED BASED ON SIX USGS GROUNDWATER STUDIES PERFORMED IN THE EAST CHICAGO AREA. THE USGS STUDIES PRODUCED TEN (10) GROUNDWATER FLOW FIGURES FOR THE FOLLOWING MONTHS: 03/86, 05/86, 09/86, 07/88, 08/88, 02/90, 11/90, 06/92, 09/92, AND 07/97 THROUGH 02/2001.
  - GROUNDWATER FLOW DIRECTION
  - GRAND CALUMET FLOW DIRECTION




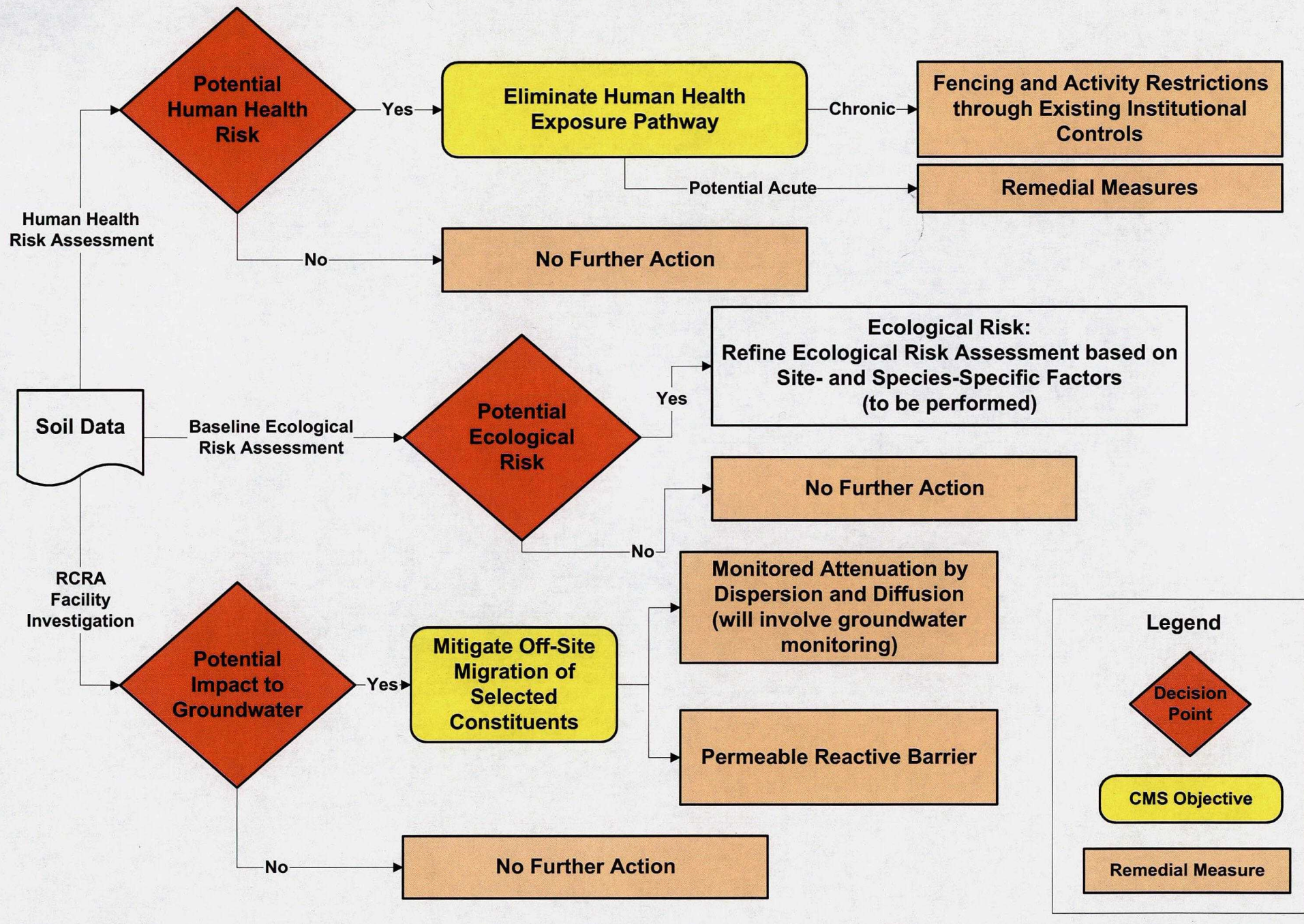
DESIGNED S. KUMAR	INITIALS	 <b>Corporate Remediation Group</b> <i>An Alliance between DuPont and URS Diamond</i>	<b>PROPOSED PRB WALL LOCATION MAP</b>	
DRAWN D.H. ENGLISH				
CHECKED S. KUMAR			DuPont East Chicago Facility East Chicago, Indiana	
APPROVED(DESIGN)				
APPROVED(CONSTRUCTION)		Barley Mill Plaza, Building 19 Wilmington, Delaware 19805	SCALE 1" = 400'	DATE 10-30-2006
			CAD FILE NO. FIG. 5.1	FIGURE 5.1

Figure 7.1 Remediation Technology Selection Decision Tree



## **APPENDICES**

**APPENDIX A**  
**RISK ASSESSMENT CALCULATIONS FOR SOIL**

**Appendix A**  
**SWMU 2D Surface Soil**  
**Constituents of Potential Concern**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

Analyte <sup>1</sup>	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind. Soil <sup>2</sup> HQ=0.1	COPC Y/N?
ANTIMONY	7440360	mg/kg	4	4	1.61E+00	2.21E+00	4.10E+01	No
ARSENIC	7440382	mg/kg	4	4	8.28E+00	1.25E+01	1.60E-01	Yes
BARIUM	7440393	mg/kg	4	4	2.64E+02	3.50E+02	6.70E+03	No
BERYLLIUM	7440417	mg/kg	4	4	5.50E+00	9.19E+00	1.90E+02	No
CADMIUM	7440439	mg/kg	4	4	7.73E+00	1.74E+01	4.50E+01	No
CHROMIUM	7440473	mg/kg	4	4	3.22E+01	3.94E+01	4.50E+01	No
COBALT	7440484	mg/kg	4	4	1.38E+01	2.26E+01	1.90E+02	No
COPPER	7440508	mg/kg	4	4	8.51E+01	1.15E+02	4.10E+03	No
IRON	7439896	mg/kg	4	4	5.09E+04	7.79E+04	1.00E+04	Yes
LEAD	7439921	mg/kg	4	4	1.09E+02	2.08E+02	8.00E+02	No
MANGANESE	7439965	mg/kg	4	4	3.62E+02	4.85E+02	1.90E+03	No
MERCURY	7439976	mg/kg	4	4	1.94E-01	4.03E-01	3.10E+01	No
NICKEL	7440020	mg/kg	4	4	6.68E+01	1.06E+02	2.00E+03	No
SELENIUM	7782492	mg/kg	4	4	2.26E+00	4.00E+00	5.10E+02	No
SILVER	7440224	mg/kg	4	4	9.68E-01	1.33E+00	5.10E+02	No
THALLIUM	7440280	mg/kg	4	4	2.19E-01	4.00E-01	6.70E+00	No
VANADIUM	7440622	mg/kg	4	4	6.01E+01	7.74E+01	1.00E+02	No
ZINC	7440666	mg/kg	4	4	2.21E+03	3.79E+03	1.00E+04	No

**Notes:**

1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.

2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).

PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .

DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).

Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)

3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

**Appendix A**  
**SWMU 10B Surface Soil**  
**Constituents of Potential Concern**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

Analyte	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
ANTIMONY	7440360	mg/kg	2	2	1.05E+02	1.20E+02	4.10E+01	Yes
ARSENIC	7440382	mg/kg	2	2	2.08E+02	2.55E+02	1.60E-01	Yes
BARIUM	7440393	mg/kg	2	2	4.95E+01	5.43E+01	6.70E+03	No
BERYLLIUM	7440417	mg/kg	2	2	2.98E-01	3.84E-01	1.90E+02	No
CADMIUM	7440439	mg/kg	2	2	4.91E+02	6.71E+02	4.50E+01	Yes
CHROMIUM	7440473	mg/kg	2	2	4.67E+00	5.98E+00	4.50E+01	No
COBALT	7440484	mg/kg	2	2	1.44E+00	2.35E+00	1.90E+02	No
COPPER	7440508	mg/kg	2	2	9.67E+01	1.13E+02	4.10E+03	No
IRON	7439896	mg/kg	2	2	8.28E+03	9.02E+03	1.00E+04	No
LEAD	7439921	mg/kg	2	2	1.44E+05	1.47E+05	8.00E+02	Yes
MANGANESE	7439965	mg/kg	2	2	2.81E+02	3.68E+02	1.90E+03	No
MERCURY	7439976	mg/kg	2	2	3.90E+01	5.21E+01	3.10E+01	Yes
NICKEL	7440020	mg/kg	2	2	4.03E+00	5.12E+00	2.00E+03	No
SELENIUM	7782492	mg/kg	2	2	1.17E+01	1.34E+01	5.10E+02	No
SILVER	7440224	mg/kg	2	2	7.95E+01	1.00E+02	5.10E+02	No
THALLIUM	7440280	mg/kg	2	2	7.64E-01	8.81E-01	6.70E+00	No
VANADIUM	7440622	mg/kg	2	2	4.74E+00	5.75E+00	1.00E+02	No
ZINC	7440666	mg/kg	2	2	2.63E+03	4.10E+03	1.00E+04	No

**Notes:**

- 1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.
- 2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).  
PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .  
DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).  
Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)
- 3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

**Appendix A**  
**SWMU 10C Surface Soil**  
**Constituents of Potential Concern**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

Analyte	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
ANTIMONY	7440360	mg/kg	9	9	4.68E+00	1.06E+01	4.10E+01	No
ARSENIC	7440382	mg/kg	9	9	6.94E+00	1.73E+01	1.60E-01	Yes
BARIUM	7440393	mg/kg	4	4	7.87E+00	1.20E+01	6.70E+03	No
BERYLLIUM	7440417	mg/kg	4	1	3.41E-02	5.85E-02	1.90E+02	No
CADMIUM	7440439	mg/kg	4	4	1.51E+00	3.16E+00	4.50E+01	No
CHLORIDE	16887006	mg/kg	3	3	3.81E+01	1.02E+02	1.05E+05	No
CHROMIUM	7440473	mg/kg	4	4	4.48E+00	8.52E+00	4.50E+01	No
COBALT	7440484	mg/kg	4	4	7.82E-01	1.36E+00	1.90E+02	No
COPPER	7440508	mg/kg	4	4	7.60E+00	1.52E+01	4.10E+03	No
FLUORIDE	16984488	mg/kg	3	3	7.33E+01	1.50E+02	3.70E+03	No
IRON	7439896	mg/kg	4	4	2.03E+03	2.77E+03	1.00E+04	No
LEAD	7439921	mg/kg	4	4	1.58E+02	2.91E+02	8.00E+02	No
MANGANESE	7439965	mg/kg	4	4	1.56E+01	1.96E+01	1.90E+03	No
MERCURY	7439976	mg/kg	4	4	7.17E-01	1.03E+00	3.10E+01	No
NICKEL	7440020	mg/kg	4	4	1.59E+00	2.20E+00	2.00E+03	No
SELENIUM	7782492	mg/kg	4	2	5.31E-01	1.09E+00	5.10E+02	No
SILVER	7440224	mg/kg	4	1	3.01E-01	8.55E-01	5.10E+02	No
SULFATE	14808798	mg/kg	3	3	2.41E+02	6.26E+02	1.30E+06	No
TETRACHLOROETHYLENE	127184	mg/kg	3	1	9.00E-03	2.10E-02	1.30E-01	No
THALLIUM	7440280	mg/kg	4	4	5.83E-02	8.78E-02	6.70E+00	No
TRICHLOROFLUOROMETHANE	75694	mg/kg	3	1	4.33E-03	7.00E-03	2.00E+02	No
VANADIUM	7440622	mg/kg	4	4	3.57E+00	4.14E+00	1.00E+02	No
ZINC	7440666	mg/kg	4	4	2.02E+02	3.83E+02	1.00E+04	No

**Notes:**

- 1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.
- 2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).  
PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .  
DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).  
Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)
- 3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

Appendix A  
SWMU 14 Surface Soil  
Constituents of Potential Concern  
DuPont East Chicago Facility  
East Chicago, Indiana

Analyte	CAS NO	Units	Number of Samples	Number of Defects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
ANTIMONY	7440360	mg/kg	10	10	7.14E+00	1.62E+01	4.10E+01	No
ARSENIC	7440382	mg/kg	10	10	5.57E+02	2.77E+03	1.60E-01	Yes
BARIUM	7440393	mg/kg	7	7	8.92E+01	2.14E+02	6.70E+03	No
BERYLLIUM	7440417	mg/kg	7	7	4.62E-01	1.99E+00	1.90E+02	No
CADMIUM	7440439	mg/kg	10	10	2.87E+01	9.22E+01	4.50E+01	Yes
CHROMIUM	7440473	mg/kg	10	10	1.71E+01	3.42E+01	4.50E+01	No
COBALT	7440484	mg/kg	7	7	2.92E+00	5.80E+00	1.90E+02	No
COPPER	7440508	mg/kg	7	7	1.78E+02	4.25E+02	4.10E+03	No
IRON	7439896	mg/kg	7	7	1.30E+04	3.19E+04	1.00E+04	Yes
LEAD	7439921	mg/kg	7	7	1.05E+03	2.90E+03	8.00E+02	Yes
MANGANESE	7439965	mg/kg	7	7	1.06E+02	4.47E+02	1.90E+03	No
MERCURY	7439976	mg/kg	7	6	9.92E+00	4.87E+01	3.10E+01	Yes
NICKEL	7440020	mg/kg	7	7	9.08E+00	2.67E+01	2.00E+03	No
SELENIUM	7782492	mg/kg	7	6	9.22E+00	3.41E+01	5.10E+02	No
SILVER	7440224	mg/kg	7	4	4.73E+00	1.13E+01	5.10E+02	No
THALLIUM	7440280	mg/kg	7	7	2.26E-01	6.61E-01	6.70E+00	No
VANADIUM	7440622	mg/kg	7	7	1.09E+01	2.39E+01	1.00E+02	No
ZINC	7440666	mg/kg	10	10	4.85E+03	1.42E+04	1.00E+04	Yes

Notes:

- 1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.
- 2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).  
PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .  
DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).  
Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)
- 3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

Appendix A  
AOC 1C Surface Soil  
Constituents of Potential Concern  
DuPont East Chicago Facility  
East Chicago, Indiana

Analyte <sup>1</sup>	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
SULFATE	14808798	mg/kg	2	2	2.56E+03	4.25E+03	1.30E+06	No

Notes:

1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.

2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).

PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .

DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).

Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)

3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

Appendix A  
AOC 2C Surface Soil  
Constituents of Potential Concern  
DuPont East Chicago Facility  
East Chicago, Indiana

Analyte <sup>1</sup>	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
SULFATE	14808798	mg/kg	2	2	7.19E+01	9.92E+01	1.30E+06	No

Notes:

1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.

2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).

PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .

DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).

Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)

3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

**Appendix A**  
**AOC 3A Subsurface Soil**  
**Constituents of Potential Concern**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

Analyte	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	IDEM Migration to GW <sup>3</sup>	COPC Y/N?
CHLORIDE	16887006	mg/kg	1	1	1.23E+01	1.23E+01	1.05E+05	-	No
FLUORIDE	16984488	mg/kg	1	0	3.95E+02	3.95E+02	3.70E+03	-	No
SULFATE	14808798	mg/kg	1	1	1.59E+04	1.59E+04	1.30E+06	-	No

**Notes:**

- 1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.
- 2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).  
PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .  
DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).  
Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)
- 3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

Appendix A  
AOC 3E Surface Soil  
Constituents of Potential Concern  
DuPont East Chicago Facility  
East Chicago, Indiana

Analyte	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
SULFATE	14808798	mg/kg	1	1	1.60E+02	1.60E+02	1.30E+06	No

Notes:

- 1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.
- 2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).  
PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .  
DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).  
Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)
- 3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

**Appendix A**  
**AOC 6 Surface Soil**  
**Constituents of Potential Concern**  
**DuPont East Chicago Facility**  
**East Chicago, Indiana**

Analyte <sup>1</sup>	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
ANTIMONY	7440360	mg/kg	5	5	2.48E+01	4.83E+01	4.10E+01	Yes
ARSENIC	7440382	mg/kg	5	5	1.38E+02	3.07E+02	1.60E-01	Yes
BARIUM	7440393	mg/kg	5	5	7.49E+03	1.39E+04	6.70E+03	Yes
BERYLLIUM	7440417	mg/kg	5	4	6.01E-01	8.80E-01	1.90E+02	No
CADMIUM	7440439	mg/kg	5	5	3.50E+01	6.78E+01	4.50E+01	Yes
CHROMIUM	7440473	mg/kg	5	5	1.08E+02	4.54E+02	4.50E+01	Yes
COBALT	7440484	mg/kg	5	5	2.06E+00	3.60E+00	1.90E+02	No
COPPER	7440508	mg/kg	5	5	2.77E+02	5.95E+02	4.10E+03	No
IRON	7439896	mg/kg	5	5	3.35E+04	5.51E+04	1.00E+04	Yes
LEAD	7439921	mg/kg	5	5	7.83E+03	1.62E+04	8.00E+02	Yes
MANGANESE	7439965	mg/kg	5	5	1.63E+02	3.57E+02	1.90E+03	No
MERCURY	7439976	mg/kg	5	5	6.30E+00	2.28E+01	3.10E+01	No
NICKEL	7440020	mg/kg	5	5	2.16E+01	3.56E+01	2.00E+03	No
SELENIUM	7782492	mg/kg	5	5	8.41E+00	2.91E+01	5.10E+02	No
SILVER	7440224	mg/kg	5	4	5.64E+00	1.45E+01	5.10E+02	No
THALLIUM	7440280	mg/kg	5	5	2.15E+00	7.21E+00	6.70E+00	Yes
VANADIUM	7440622	mg/kg	5	5	1.32E+01	1.70E+01	1.00E+02	No
ZINC	7440666	mg/kg	5	5	3.67E+04	1.29E+05	1.00E+04	Yes

**Notes:**

- 1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.
- 2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).  
PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .  
DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).  
Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)
- 3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

Appendix A  
AOC 12 Surface Soil  
Constituents of Potential Concern  
DuPont East Chicago Facility  
East Chicago, Indiana

Analyte <sup>1</sup>	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind Soil <sup>2</sup> HQ=0.1	COPC Y/N?
ACETONE	67641	mg/kg	4	3	2.05E-02	3.90E-02	5.40E+03	No
ANTIMONY	7440360	mg/kg	8	8	1.54E+02	4.00E+02	4.10E+01	Yes
ARSENIC	7440382	mg/kg	8	8	1.07E+02	4.33E+02	1.60E-01	Yes
BARIUM	7440393	mg/kg	8	8	1.27E+02	3.90E+02	6.70E+03	No
BENZENE	71432	mg/kg	4	2	4.39E-03	1.00E-02	1.40E-01	No
BERYLLIUM	7440417	mg/kg	8	8	2.23E-01	3.78E-01	1.90E+02	No
CADMIUM	7440439	mg/kg	8	8	7.08E+02	3.66E+03	4.50E+01	Yes
CARBON DISULFIDE	75150	mg/kg	4	2	1.00E-03	2.00E-03	7.20E+01	No
CHLOROFORM	67663	mg/kg	4	2	2.00E-03	6.00E-03	4.70E-02	No
CHROMIUM	7440473	mg/kg	8	8	2.36E+01	4.23E+01	4.50E+01	No
COBALT	7440484	mg/kg	8	8	1.02E+01	5.08E+01	1.90E+02	No
COPPER	7440508	mg/kg	8	8	9.21E+02	4.47E+03	4.10E+03	Yes
IRON	7439896	mg/kg	8	8	4.55E+04	2.38E+05	1.00E+04	Yes
LEAD	7439921	mg/kg	8	8	2.08E+04	1.24E+05	8.00E+02	Yes
MANGANESE	7439965	mg/kg	8	8	1.03E+03	5.69E+03	1.90E+03	Yes
MERCURY	7439976	mg/kg	8	8	2.63E+01	1.47E+02	3.10E+01	Yes
NICKEL	7440020	mg/kg	8	8	7.95E+00	1.92E+01	2.00E+03	No
SELENIUM	7782492	mg/kg	8	8	1.70E+01	8.63E+01	5.10E+02	No
SILVER	7440224	mg/kg	8	8	6.67E+01	4.05E+02	5.10E+02	No
THALLIUM	7440280	mg/kg	8	8	4.46E-01	1.10E+00	6.70E+00	No
TOLUENE	108883	mg/kg	4	1	6.25E-04	1.00E-03	5.20E+01	No
TRICHLOROETHENE	79016	mg/kg	4	3	2.13E-03	4.00E-03	1.10E-02	No
VANADIUM	7440622	mg/kg	8	8	1.14E+01	2.98E+01	1.00E+02	No
ZINC	7440666	mg/kg	8	8	1.93E+04	1.05E+05	1.00E+04	Yes

Notes:

- 1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.
- 2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).  
PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .  
DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).  
Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boermgen 1984)
- 3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

**APPENDIX B**  
**UPDATED RISK ESTIMATES**

**Table B-1**  
**SWMU 2D**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Current/Future Industrial Worker**

**HQ = Chemical Intake / RfD**

**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
Arsenic	1.25E+01	9.78E-07	1.22E-05	3.00E-04	4.08E-02	3.49E-07	4.37E-06	1.50E+00	6.55E-06
Iron	7.79E+04	9.78E-07	7.62E-02	3.00E-01	2.54E-01	3.49E-07	2.72E-02	-	-
					Hazard Index =			Cancer Risk =	6.55E-06

Table B-2  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	Chemical	
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ			SF (mg/kg-day) <sup>1</sup>	Cancer Risk
Arsenic	1.25E+01	1.07E-07	1.34E-06	3.00E-04	4.46E-03	1.01E-08	1.26E-07	1.50E+00	1.89E-07
Iron	7.79E+04	1.07E-07	8.35E-03	3.00E-01	2.78E-02	1.01E-08	7.87E-04	-	-
Hazard Index =					6.01E-02	Cancer Risk = 1.89E-07			

Table B-3  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg- day)							
Arsenic	1.25E+01	6.46E-06	0.030	2.42E-06	3.00E-04	8.07E-03	2.31E-06	0.030	8.65E-07	1.50E+00	1.30E-06
Iron	7.79E+04	6.46E-06	0.010	5.03E-03	3.00E-01	1.68E-02	2.31E-06	0.010	1.80E-03	-	-
Hazard Index =						4.16E-02	Cancer Risk = 1.30E-06				

Table B-4  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk	
Arsenic	1.25E+01	1.41E-06	0.030	5.30E-07	3.00E-04	1.77E-03	1.33E-07	0.030	5.00E-08	1.50E+00	7.50E-08	
Iron	7.79E+04	1.41E-06	0.010	1.10E-03	3.00E-01	3.67E-03	1.33E-07	0.010	1.04E-04	-	-	
					Hazard Index =	9.11E-03	Cancer Risk =					7.50E-08

Table B-5  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ				
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Chemical Intake (mg/kg-day)	SFi (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	1.96E-01	1.32E+09	1.85E-09	-		6.99E-02	6.62E-10	1.50E+01	9.93E-09
Iron	7.79E+04	1.96E-01	1.32E+09	1.15E-05	-		6.99E-02	4.12E-06	-	
				-	Hazard Index =	0.00E+00	Cancer Risk = 9.93E-09			

Table B-6  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ				
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	4.29E-02	1.32E+09	4.06E-10	-		4.04E-03	3.83E-11	1.50E+01	5.74E-10
Iron	7.79E+04	4.29E-02	1.32E+09	2.53E-06	-		4.04E-03	2.38E-07	-	
Hazard Index =						0.00E+00	Cancer Risk = 5.74E-10			

Table B-7  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	1.25E+01	2.74E-07	3.42E-06	3.00E-04	1.14E-02	3.91E-08	4.89E-07	1.50E+00	7.34E-07
Iron	7.79E+04	2.74E-07	2.13E-02	3.00E-01	7.11E-02	3.91E-08	3.05E-03	-	-
Hazard Index =					1.54E-01	Cancer Risk = 7.34E-07			

Table B-8  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	1.25E+01	7.61E-09	9.51E-08	3.00E-04	3.17E-04	1.09E-09	1.36E-08	1.50E+00	2.04E-08
Iron	7.79E+04	7.61E-09	5.93E-04	3.00E-01	1.98E-03	1.09E-09	8.47E-05	-	
Hazard Index =					4.27E-03	Cancer Risk = 2.04E-08			

Table B-9  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	1.53E-06	0.030	5.75E-07	3.00E-04	1.92E-03	2.19E-07	0.030	8.22E-08	1.50E+00	1.23E-07
Iron	7.79E+04	1.53E-06	0.010	1.20E-03	3.00E-01	3.98E-03	2.19E-07	0.010	1.71E-04	-	-
Hazard Index =						9.89E-03	Cancer Risk = 1.23E-07				

Table B-10  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg-day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk	
				Intake (mg/kg-day)					(mg/kg-day)			
Arsenic	1.25E+01	4.26E-08	0.030	1.60E-08	3.00E-04	5.33E-05	6.09E-09	0.030	2.28E-09	1.50E+00	3.42E-09	
Iron	7.79E+04	4.26E-08	0.010	3.32E-05	3.00E-01	1.11E-04	6.09E-09	0.010	4.74E-06	-	-	
Hazard Index =						2.75E-04	Cancer Risk =					3.42E-09

Table B-11  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Chemical				
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk	
Arsenic	1.25E+01	1.03E-02	1.32E+09	9.73E-11	-		1.47E-03	1.39E-11	1.50E+01	2.08E-10	
Iron	7.79E+04	1.03E-02	1.32E+09	6.06E-07	-		1.47E-03	8.66E-08	-		
Hazard Index =						0.00E+00	Cancer Risk =				2.08E-10

Table B-12  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	2.85E-04	1.32E+09	2.70E-12	-		4.08E-05	3.86E-13	1.50E+01	5.79E-12
Iron	7.79E+04	2.85E-04	1.32E+09	1.68E-08	-		4.08E-05	2.41E-09	-	
Hazard Index =						0.00E+00	Cancer Risk = 5.79E-12			

Table B-13  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Future Construction Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Chemical			Cancer Risk
			Intake (mg/kg-day)	RfD (mg/kg-day)	HQ	Intake Factor (kg/kg-day)	Intake (mg/kg-day)	SF (mg/kg-day) <sup>1</sup>	
Arsenic	1.25E+01	3.23E-06	4.04E-05	3.00E-04	1.35E-01	4.61E-08	5.77E-07	1.50E+00	8.65E-07
Iron	7.79E+04	3.23E-06	2.52E-01	3.00E-01	8.38E-01	4.61E-08	3.59E-03	-	-
Hazard Index =					1.81E+00	Cancer Risk =			8.65E-07

HIs by Target Organ

0.13 Dermal/Ocular

0.84 Respiratory

Table B-14  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Future Construction Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	1.25E+01	1.45E-07	1.82E-06	3.00E-04	6.05E-03	2.08E-09	2.59E-08	1.50E+00	3.89E-08
Iron	7.79E+04	1.45E-07	1.13E-02	3.00E-01	3.77E-02	2.08E-09	1.62E-04	-	-
Hazard Index =					8.15E-02	Cancer Risk = 3.89E-08			

Table B-15  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	9.69E-06	0.030	3.63E-06	3.00E-04	1.21E-02	1.38E-07	0.030	5.19E-08	1.50E+00	7.78E-08
Iron	7.79E+04	9.69E-06	0.010	7.55E-03	3.00E-01	2.52E-02	1.38E-07	0.010	1.08E-04	-	-
Hazard Index =						6.24E-02	Cancer Risk = 7.78E-08				

Table B-16  
SWMU 2D  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	4.36E-07	0.030	1.63E-07	3.00E-04	5.45E-04	6.23E-09	0.030	2.34E-09	1.50E+00	3.50E-09
Iron	7.79E+04	4.36E-07	0.010	3.40E-04	3.00E-01	1.13E-03	6.23E-09	0.010	4.85E-06	-	-
					Hazard Index =	2.81E-03	Cancer Risk = 3.50E-09				

Table B-17  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Chemical			
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	2.58E-01	1.32E+09	2.45E-09	-		3.69E-03	3.49E-11	1.50E+01	5.24E-10
Iron	7.79E+04	2.58E-01	1.32E+09	1.52E-05	-		3.69E-03	2.18E-07	-	
Hazard Index =						0.00E+00	Cancer Risk = 5.24E-10			

Table B-18  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ				
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	1.25E+01	8.81E-03	1.32E+09	8.34E-11	-		1.26E-04	1.19E-12	1.50E+01	1.79E-11
Iron	7.79E+04	8.81E-03	1.32E+09	5.20E-07	-		1.26E-04	7.42E-09	-	
Hazard Index =						0.00E+00	Cancer Risk = 1.79E-11			

Table B-19  
SWMU 2D  
DuPont East Chicago Facility  
SUBSURFACE SOIL INGESTION - RME  
Future Construction Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical		HQ	Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg-day)	RfD (mg/kg-day)			Intake (mg/kg-day)	SF (mg/kg-day) <sup>-1</sup>	
Arsenic	2.24E+01	3.23E-06	7.23E-05	3.00E-04	2.41E-01	4.61E-08	1.03E-06	1.50E+00	1.55E-06
Hazard Index =					2.41E-01	Cancer Risk =			1.55E-06

Table B-20  
SWMU 2D  
DuPont East Chicago Facility  
SUBSURFACE SOIL INGESTION - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			HQ	Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)				Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Arsenic	2.24E+01	1.45E-07	3.25E-06	3.00E-04	1.08E-02		2.08E-09	4.65E-08	1.50E+00	6.97E-08
				Hazard Index =	1.08E-02				Cancer Risk =	6.97E-08

Table B-21  
SWMU 2D  
DuPont East Chicago Facility  
SUBSURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake	SFD (mg/kg- day) <sup>1</sup>	Cancer Risk	
				Intake (mg/kg- day)					(mg/kg-day)			
Arsenic	2.24E+01	9.69E-06	0.030	6.51E-06	3.00E-04	2.17E-02	1.38E-07	0.030	9.30E-08	1.50E+00	1.39E-07	
					Hazard Index =	2.17E-02	Cancer Risk =					1.39E-07

Table B-22  
SWMU 2D  
DuPont East Chicago Facility  
SUBSURFACE SOIL DERMAL CONTACT - CT  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	2.24E+01	4.36E-07	0.030	2.93E-07	3.00E-04	9.76E-04	6.23E-09	0.030	4.18E-09	1.50E+00	6.28E-09
						Hazard Index =				Cancer Risk =	6.28E-09

Table B-23  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)

VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)	HQ		Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	
Arsenic	2.24E+01	2.58E-01	1.32E+09	4.38E-09	-		3.69E-03	6.26E-11	1.50E+01	9.39E-10
Hazard Index =						0.00E+00	Cancer Risk = 9.39E-10			

Table B-24  
SWMU 2D  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $\text{m}^3/\text{kg}$ )  
VF = Volatilization factor ( $\text{m}^3/\text{kg}$ ), chemical specific  
RfD = Reference Dose ( $\text{mg}/\text{kg}\cdot\text{day}$ )  
SF = Cancer Slope Factor ( $(\text{mg}/\text{kg}\cdot\text{day})^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor ( $\text{m}^3/\text{kg}\cdot\text{day}$ )	PEF or VF ( $\text{m}^3/\text{kg}$ )	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor ( $\text{m}^3/\text{kg}\cdot\text{day}$ )	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	2.24E+01	8.81E-03	1.32E+09	1.49E-10	-		1.26E-04	2.13E-12	1.50E+01	3.20E-11
Hazard Index =						0.00E+00	Cancer Risk = 3.20E-11			

Table B-25  
Summary of Health Risks, SWMU 2D  
DuPont East Chicago Facility  
East Chicago, Indiana

Receptor/Pathway	RME		CT	
	HI	CR	HI	CR
Current/Future Industrial Worker				
Surface Soil Ingestion	5.E-01	7.E-06	6.E-02	2.E-07
Surface Soil Dermal Contact	4.E-02	1.E-06	9.E-03	8.E-08
Inhalation of Air Particulates - Surface Soil	0.E+00	1.E-08	0.E+00	6.E-10
<b>Total</b>	<b>6.E-01</b>	<b>8.E-06</b>	<b>7.E-02</b>	<b>3.E-07</b>
Current/Future Trespasser				
Surface Soil Ingestion	2.E-01	7.E-07	4.E-03	2.E-08
Surface Soil Dermal Contact	1.E-02	1.E-07	3.E-04	3.E-09
Inhalation of Air Particulates - Surface Soil	0.E+00	2.E-10	0.E+00	6.E-12
<b>Total</b>	<b>2.E-01</b>	<b>9.E-07</b>	<b>5.E-03</b>	<b>2.E-08</b>
Future Construction Worker				
Surface Soil Ingestion	2.E+00	9.E-07	8.E-02	4.E-08
Surface Soil Dermal Contact	6.E-02	8.E-08	3.E-03	4.E-09
Inhalation of Air Particulates - Surface Soil	0.E+00	5.E-10	0.E+00	2.E-11
Subsurface Soil Ingestion	2.E-01	2.E-06	1.E-02	7.E-08
Subsurface Soil Dermal Contact	2.E-02	1.E-07	1.E-03	6.E-09
Inhalation of Air Particulates - Subsurface Soil	0.E+00	9.E-10	0.E+00	3.E-11
<b>Total</b>	<b>2.E+00</b>	<b>3.E-06</b>	<b>1.E-01</b>	<b>1.E-07</b>

Table B-26  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	1.20E+02	9.78E-07	1.17E-04	4.00E-04	2.94E-01	3.49E-07	4.19E-05	-	
Arsenic	2.55E+02	9.78E-07	2.50E-04	3.00E-04	8.32E-01	3.49E-07	8.91E-05	1.50E+00	1.34E-04
Cadmium	6.71E+02	9.78E-07	6.57E-04	5.00E-04	1.31E+00	3.49E-07	2.34E-04	-	
Mercury	5.21E+01	9.78E-07	5.10E-05	3.00E-04	1.70E-01	3.49E-07	1.82E-05	-	
Hazard Index =					2.61E+00	Cancer Risk = 1.34E-04			

HIs by Target Organ

0.29 Circulatory

0.83 Dermal/Ocular

1.5 Systemic(Kidney)

Table B-27  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ			Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Antimony	1.20E+02	1.07E-07	1.29E-05	4.00E-04	3.21E-02	1.01E-08	1.21E-06	-	-	-
Arsenic	2.55E+02	1.07E-07	2.73E-05	3.00E-04	9.11E-02	1.01E-08	2.58E-06	1.50E+00	3.86E-06	3.86E-06
Cadmium	6.71E+02	1.07E-07	7.19E-05	5.00E-04	1.44E-01	1.01E-08	6.78E-06	-	-	-
Mercury	5.21E+01	1.07E-07	5.58E-06	3.00E-04	1.86E-02	1.01E-08	5.26E-07	-	-	-
Hazard Index =					2.86E-01	Cancer Risk = 3.86E-06				

Table B-28  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.20E+02	6.46E-06	0.010	7.75E-06	4.00E-04	1.94E-02	2.31E-06	0.010	2.77E-06	-	
Arsenic	2.55E+02	6.46E-06	0.030	4.94E-05	3.00E-04	1.65E-01	2.31E-06	0.030	1.76E-05	1.50E+00	2.65E-05
Cadmium	6.71E+02	6.46E-06	0.001	4.33E-06	1.25E-05	3.47E-01	2.31E-06	0.001	1.55E-06	-	
Mercury	5.21E+01	6.46E-06	0.010	3.36E-06	3.00E-04	1.12E-02	2.31E-06	0.010	1.20E-06	-	
Hazard Index =						5.42E-01	Cancer Risk =				2.65E-05

Table B-29  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg-day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg-day)							
Antimony	1.20E+02	1.41E-06	0.010	1.70E-06	4.00E-04	4.24E-03	1.33E-07	0.010	1.60E-07	-	
Arsenic	2.55E+02	1.41E-06	0.030	1.08E-05	3.00E-04	3.61E-02	1.33E-07	0.030	1.02E-06	1.50E+00	1.53E-06
Cadmium	6.71E+02	1.41E-06	0.001	9.49E-07	1.25E-05	7.59E-02	1.33E-07	0.001	8.95E-08	-	
Mercury	5.21E+01	1.41E-06	0.010	7.37E-07	3.00E-04	2.46E-03	1.33E-07	0.010	6.95E-08	-	
Hazard Index =						1.19E-01	Cancer Risk = 1.53E-06				

Table B-30  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical			Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk	
				Intake (mg/kg-day)	RfDi (mg/kg-day)	HQ					
Antimony	1.20E+02	1.96E-01	1.32E+09	1.78E-08	-		shc 6.99E-02	6.35E-09	-		
Arsenic	2.55E+02	1.96E-01	1.32E+09	3.78E-08	-		shc 6.99E-02	1.35E-08	1.50E+01	2.03E-07	
Cadmium	6.71E+02	1.96E-01	1.32E+09	9.95E-08	-		shc 6.99E-02	3.55E-08	6.30E+00	2.24E-07	
Mercury	5.21E+01	1.96E-01	1.32E+09	7.72E-09	8.60E-05	8.98E-05	shc 6.99E-02	2.76E-09	-		
Hazard Index =						8.98E-05	Cancer Risk =				4.26E-07

Table B-31  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.20E+02	4.29E-02	1.32E+09	3.90E-09	-		4.04E-03	3.67E-10	-	
Arsenic	2.55E+02	4.29E-02	1.32E+09	8.28E-09	-		4.04E-03	7.81E-10	1.50E+01	1.17E-08
Cadmium	6.71E+02	4.29E-02	1.32E+09	2.18E-08	-		4.04E-03	2.05E-09	6.30E+00	1.29E-08
Mercury	5.21E+01	4.29E-02	1.32E+09	1.69E-09	8.60E-05	1.97E-05	4.04E-03	1.59E-10	-	
Hazard Index =						1.97E-05	Cancer Risk = 2.46E-08			

**Table B-32**  
**SWMU 10B**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Current/Future Trespasser**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	1.20E+02	2.74E-07	3.29E-05	4.00E-04	8.22E-02	3.91E-08	4.70E-06	-	
Arsenic	2.55E+02	2.74E-07	6.99E-05	3.00E-04	2.33E-01	3.91E-08	9.98E-06	1.50E+00	1.50E-05
Cadmium	6.71E+02	2.74E-07	1.84E-04	5.00E-04	3.68E-01	3.91E-08	2.63E-05	-	
Mercury	5.21E+01	2.74E-07	1.43E-05	3.00E-04	4.76E-02	3.91E-08	2.04E-06	-	
Hazard Index =					7.30E-01	Cancer Risk = 1.50E-05			

**Table B-33**  
**SWMU 10B**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - CT**  
**Current/Future Trespasser**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	1.20E+02	7.61E-09	9.13E-07	4.00E-04	2.28E-03	1.09E-09	1.30E-07	-	
Arsenic	2.55E+02	7.61E-09	1.94E-06	3.00E-04	6.47E-03	1.09E-09	2.77E-07	1.50E+00	4.16E-07
Cadmium	6.71E+02	7.61E-09	5.11E-06	5.00E-04	1.02E-02	1.09E-09	7.30E-07	-	
Mercury	5.21E+01	7.61E-09	3.96E-07	3.00E-04	1.32E-03	1.09E-09	5.66E-08	-	
Hazard Index =					2.03E-02	Cancer Risk = 4.16E-07			

Table B-34  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)			HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
Antimony	1.20E+02	1.53E-06	0.010	1.84E-06	4.00E-04	4.60E-03		2.19E-07	0.010	2.63E-07	-	
Arsenic	2.55E+02	1.53E-06	0.030	1.17E-05	3.00E-04	3.91E-02		2.19E-07	0.030	1.68E-06	1.50E+00	2.52E-06
Cadmium	6.71E+02	1.53E-06	0.001	1.03E-06	1.25E-05	8.24E-02		2.19E-07	0.001	1.47E-07	-	
Mercury	5.21E+01	1.53E-06	0.010	7.99E-07	3.00E-04	2.66E-03		2.19E-07	0.010	1.14E-07	-	
Hazard Index =						1.29E-01	Cancer Risk = 2.52E-06					

Table B-35  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk	
				Intake (mg/kg- day)					(mg/kg-day)			
Antimony	1.20E+02	4.26E-08	0.010	5.11E-08	4.00E-04	1.28E-04	6.09E-09	0.010	7.31E-09	-		
Arsenic	2.55E+02	4.26E-08	0.030	3.26E-07	3.00E-04	1.09E-03	6.09E-09	0.030	4.66E-08	1.50E+00	6.99E-08	
Cadmium	6.71E+02	4.26E-08	0.001	2.86E-08	1.25E-05	2.29E-03	6.09E-09	0.001	4.09E-09	-		
Mercury	5.21E+01	4.26E-08	0.010	2.22E-08	3.00E-04	7.40E-05	6.09E-09	0.010	3.17E-09	-		
Hazard Index =						3.58E-03	Cancer Risk =					6.99E-08

Table B-36  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $m^3/kg$ )  
VF = Volatilization factor ( $m^3/kg$ ), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ( $(mg/kg-day)^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor ( $m^3/kg\text{-day}$ )	PEF or VF ( $m^3/kg$ )	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor ( $m^3/kg\text{-day}$ )	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.20E+02	1.03E-02	1.32E+09	9.34E-10	-		1.47E-03	1.33E-10	-	
Arsenic	2.55E+02	1.03E-02	1.32E+09	1.98E-09	-		1.47E-03	2.84E-10	1.50E+01	4.25E-09
Cadmium	6.71E+02	1.03E-02	1.32E+09	5.22E-09	-		1.47E-03	7.46E-10	6.30E+00	4.70E-09
Mercury	5.21E+01	1.03E-02	1.32E+09	4.06E-10	8.60E-05	4.72E-06	1.47E-03	5.79E-11	-	
					Hazard Index =	4.72E-06				
									Cancer Risk =	8.95E-09

Table B-37  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.20E+02	2.85E-04	1.32E+09	2.59E-11	-		4.08E-05	3.71E-12	-	
Arsenic	2.55E+02	2.85E-04	1.32E+09	5.51E-11	-		4.08E-05	7.88E-12	1.50E+01	1.18E-10
Cadmium	6.71E+02	2.85E-04	1.32E+09	1.45E-10	-		4.08E-05	2.07E-11	6.30E+00	1.31E-10
Mercury	5.21E+01	2.85E-04	1.32E+09	1.13E-11	8.60E-05	1.31E-07	4.08E-05	1.61E-12	-	
Hazard Index =						1.31E-07	Cancer Risk = 2.49E-10			

**Table B-38**  
**SWMU 10B**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	1.20E+02	3.23E-06	3.87E-04	4.00E-04	9.69E-01	4.61E-08	5.54E-06	-	
Arsenic	2.55E+02	3.23E-06	8.23E-04	3.00E-04	2.74E+00	4.61E-08	1.18E-05	1.50E+00	1.76E-05
Cadmium	6.71E+02	3.23E-06	2.17E-03	5.00E-04	4.33E+00	4.61E-08	3.10E-05	-	
Mercury	5.21E+01	3.23E-06	1.68E-04	3.00E-04	5.61E-01	4.61E-08	2.40E-06	-	
Hazard Index =					8.61E+00	Cancer Risk = 1.76E-05			

HIs by Target Organ

0.97 Circulatory  
 2.74 Dermal/Ocular  
 4.9 Systemic(Kidney)

**Table B-39**  
**SWMU 10B**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - CT**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ		Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Antimony	1.20E+02	1.45E-07	1.74E-05	4.00E-04	4.36E-02	2.08E-09	2.49E-07	-	
Arsenic	2.55E+02	1.45E-07	3.71E-05	3.00E-04	1.24E-01	2.08E-09	5.29E-07	1.50E+00	7.94E-07
Cadmium	6.71E+02	1.45E-07	9.75E-05	5.00E-04	1.95E-01	2.08E-09	1.39E-06	-	
Mercury	5.21E+01	1.45E-07	7.57E-06	3.00E-04	2.52E-02	2.08E-09	1.08E-07	-	
Hazard Index =					3.87E-01	Cancer Risk = 7.94E-07			

Table B-40  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg-day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg-day)							
Antimony	1.20E+02	9.69E-06	0.010	1.16E-05	4.00E-04	2.91E-02	1.38E-07	0.010	1.66E-07	-	
Arsenic	2.55E+02	9.69E-06	0.030	7.41E-05	3.00E-04	2.47E-01	1.38E-07	0.030	1.06E-06	1.50E+00	1.59E-06
Cadmium	6.71E+02	9.69E-06	0.001	6.50E-06	1.25E-05	5.20E-01	1.38E-07	0.001	9.29E-08	-	
Mercury	5.21E+01	9.69E-06	0.010	5.05E-06	3.00E-04	1.68E-02	1.38E-07	0.010	7.21E-08	-	
Hazard Index =						8.13E-01	Cancer Risk = 1.59E-06				

Table B-41  
SWMU 10B  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical				Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk	
			AB	Intake (mg/kg-day)	RfD (mg/kg-day)	HQ						
Antimony	1.20E+02	4.36E-07	0.010	5.23E-07	4.00E-04	1.31E-03	6.23E-09	0.010	7.47E-09	-		
Arsenic	2.55E+02	4.36E-07	0.030	3.33E-06	3.00E-04	1.11E-02	6.23E-09	0.030	4.76E-08	1.50E+00	7.15E-08	
Cadmium	6.71E+02	4.36E-07	0.001	2.92E-07	1.25E-05	2.34E-02	6.23E-09	0.001	4.18E-09	-		
Mercury	5.21E+01	4.36E-07	0.010	2.27E-07	3.00E-04	7.57E-04	6.23E-09	0.010	3.24E-09	-		
Hazard Index =						3.66E-02	Cancer Risk =					7.15E-08

Table B-42  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.20E+02	2.58E-01	1.32E+09	2.35E-08	-		3.69E-03	3.35E-10	-	
Arsenic	2.55E+02	2.58E-01	1.32E+09	4.99E-08	-		3.69E-03	7.13E-10	1.50E+01	1.07E-08
Cadmium	6.71E+02	2.58E-01	1.32E+09	1.31E-07	-		3.69E-03	1.88E-09	6.30E+00	1.18E-08
Mercury	5.21E+01	2.58E-01	1.32E+09	1.02E-08	8.60E-05	1.19E-04	3.69E-03	1.46E-10	-	
					Hazard Index =	1.19E-04				
										Cancer Risk = 2.25E-08

Table B-43  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk	
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>		
Antimony	1.20E+02	8.81E-03	1.32E+09	8.01E-10	-		1.26E-04	1.14E-11	-		
Arsenic	2.55E+02	8.81E-03	1.32E+09	1.70E-09	-		1.26E-04	2.43E-11	1.50E+01	3.65E-10	
Cadmium	6.71E+02	8.81E-03	1.32E+09	4.48E-09	-		1.26E-04	6.40E-11	6.30E+00	4.03E-10	
Mercury	5.21E+01	8.81E-03	1.32E+09	3.48E-10	8.60E-05	4.04E-06	1.26E-04	4.97E-12	-		
Zinc	0.00E+00	8.81E-03	1.32E+09	0.00E+00	-		1.26E-04	0.00E+00	-		
Hazard Index =						4.04E-06	Cancer Risk =				7.67E-10

**Table B-44**  
**SWMU 10B**  
**DuPont East Chicago Facility**  
**SUBSURFACE SOIL INGESTION - RME**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	5.40E+00	3.23E-06	1.74E-05	3.00E-04	5.81E-02	4.61E-08	2.49E-07	1.50E+00	3.74E-07
					Hazard Index =	5.81E-02	Cancer Risk =		
									3.74E-07

Table B-45  
SWMU 10B  
DuPont East Chicago Facility  
SUBSURFACE SOIL INGESTION - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical		HQ	Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)			Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Arsenic	5.40E+00	1.45E-07	7.85E-07	3.00E-04	2.62E-03	2.08E-09	1.12E-08	1.50E+00	1.68E-08
Hazard Index =					2.62E-03	Cancer Risk = 1.68E-08			

Table B-46  
SWMU 10B  
DuPont East Chicago Facility  
SUBSURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>†</sup>	Cancer Risk	
Arsenic	5.40E+00	9.69E-06	0.030	1.57E-06	3.00E-04	5.23E-03	1.38E-07	0.030	2.24E-08	1.50E+00	3.36E-08	
Hazard Index =						5.23E-03	Cancer Risk =					3.36E-08

Table B-47  
SWMU 10B  
DuPont East Chicago Facility  
SUBSURFACE SOIL DERMAL CONTACT - CT  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)			HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
				RfD (mg/kg-day)								
Arsenic	5.40E+00	4.36E-07	0.030	7.06E-08	3.00E-04	2.35E-04		6.23E-09	0.030	1.01E-09	1.50E+00	1.51E-09
Hazard Index =							2.35E-04	Cancer Risk =				

Table B-48  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $m^3/kg$ )  
VF = Volatilization factor ( $m^3/kg$ ), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ( $(mg/kg-day)^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m³/kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day)¹	Cancer Risk
Arsenic	5.40E+00	2.58E-01	1.32E+09	1.06E-09	-		3.69E-03	1.51E-11	1.50E+01	2.26E-10
Hazard Index =						0.00E+00	Cancer Risk = 2.26E-10			

Table B-49  
SWMU 10B  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $m^3/kg$ )  
VF = Volatilization factor ( $m^3/kg$ ), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ( $(mg/kg-day)^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk	
Arsenic	5.40E+00	8.81E-03	1.32E+09	3.60E-11	-		1.26E-04	5.15E-13	1.50E+01	7.72E-12	
Hazard Index =						0.00E+00	Cancer Risk =				7.72E-12

Table B-50  
Summary of Health Risks, SWMU 10B  
DuPont East Chicago Facility  
East Chicago, Indiana

Receptor/Pathway	RME		CT	
	HI	CR	HI	CR
Current/Future Industrial Worker				
Surface Soil Ingestion	3.E+00	1.E-04	3.E-01	4.E-06
Surface Soil Dermal Contact	5.E-01	3.E-05	1.E-01	2.E-06
Inhalation of Air Particulates - Surface Soil	9.E-05	4.E-07	2.E-05	2.E-08
<b>Total</b>	<b>3.E+00</b>	<b>2.E-04</b>	<b>4.E-01</b>	<b>5.E-06</b>
Current/Future Trespasser				
Surface Soil Ingestion	7.E-01	1.E-05	2.E-02	4.E-07
Surface Soil Dermal Contact	1.E-01	3.E-06	4.E-03	7.E-08
Inhalation of Air Particulates - Surface Soil	5.E-06	9.E-09	1.E-07	2.E-10
<b>Total</b>	<b>9.E-01</b>	<b>2.E-05</b>	<b>2.E-02</b>	<b>5.E-07</b>
Future Construction Worker				
Surface Soil Ingestion	9.E+00	2.E-05	4.E-01	8.E-07
Surface Soil Dermal Contact	8.E-01	2.E-06	4.E-02	7.E-08
Inhalation of Air Particulates - Surface Soil	1.E-04	2.E-08	4.E-06	8.E-10
Subsurface Soil Ingestion	6.E-02	4.E-07	3.E-03	2.E-08
Subsurface Soil Dermal Contact	5.E-03	3.E-08	2.E-04	2.E-09
Inhalation of Air Particulates - Subsurface Soil	0.E+00	2.E-10	0.E+00	8.E-12
<b>Total</b>	<b>9.E+00</b>	<b>2.E-05</b>	<b>4.E-01</b>	<b>9.E-07</b>

**Table B-51**  
**SWMU 10C**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Current/Future Industrial Worker**

**HQ = Chemical Intake / RfD**

**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	6.74E+00	9.78E-07	6.59E-06	3.00E-04	2.20E-02	3.49E-07	2.36E-06	1.50E+00	3.53E-06
Hazard Index =					2.20E-02	Cancer Risk = 3.53E-06			

Table B-52  
SWMU 10C  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical		HQ	Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)			Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Arsenic	6.74E+00	1.07E-07	7.22E-07	3.00E-04	2.41E-03	1.01E-08	6.81E-08	1.50E+00	1.02E-07
Hazard Index =					2.41E-03	Cancer Risk = 1.02E-07			

Table B-53  
SWMU 10C  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg-day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake	SFD (mg/kg-day) <sup>1</sup>	Cancer Risk
				Intake (mg/kg-day)					(mg/kg-day)		
Arsenic	6.74E+00	6.46E-06	0.030	1.31E-06	3.00E-04	4.35E-03	2.31E-06	0.030	4.66E-07	1.50E+00	7.00E-07
					Hazard Index =	4.35E-03					

Table B-54  
SWMU 10C  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	6.74E+00	1.41E-06	0.030	2.86E-07	3.00E-04	9.53E-04	1.33E-07	0.030	2.70E-08	1.50E+00	4.04E-08
						Hazard Index =				Cancer Risk =	4.04E-08

Table B-55  
SWMU 10C  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m³/kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg- day)⁻¹	Cancer Risk
Arsenic	6.74E+00	1.96E-01	1.32E+09	9.99E-10	-		shc 6.99E-02	3.57E-10	1.50E+01	5.35E-09
Hazard Index =						0.00E+00	Cancer Risk = 5.35E-09			

Table B-56  
SWMU 10C  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	6.74E+00	4.29E-02	1.32E+09	2.19E-10	-		4.04E-03	2.06E-11	1.50E+01	3.09E-10
Hazard Index =						0.00E+00	Cancer Risk =			
							3.09E-10			

Table B-57  
SWMU 10C  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>-1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	6.74E+00	2.74E-07	1.85E-06	3.00E-04	6.16E-03	3.91E-08	2.64E-07	1.50E+00	3.96E-07
				Hazard Index =	6.16E-03			Cancer Risk =	3.96E-07

**Table B-58**  
**SWMU 10C**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - CT**  
**Current/Future Trespasser**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			HQ	Chemical			Cancer Risk
			Intake (mg/kg-day)	RfD (mg/kg-day)			Intake Factor (kg/kg-day)	Intake (mg/kg-day)	SF (mg/kg-day) <sup>-1</sup>	
Arsenic	6.74E+00	7.61E-09	5.13E-08	3.00E-04	1.71E-04		1.09E-09	7.33E-09	1.50E+00	1.10E-08
				Hazard Index =	1.71E-04				Cancer Risk =	1.10E-08

**Table B-59**  
**SWMU 10C**  
**DuPont East Chicago Facility**  
**SURFACE SOIL DERMAL CONTACT - RMI**  
**Current/Future Trespasser**

**Chemical Intake = Conc. x Intake Factor x AB**

**HQ = Chemical Intake / RfD**

**CR = Chemical Intake x SF**

**Where:**

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	6.74E+00	1.53E-06	0.030	3.10E-07	3.00E-04	1.03E-03	2.19E-07	0.030	4.43E-08	1.50E+00	6.65E-08
					Hazard Index =	1.03E-03				Cancer Risk =	6.65E-08

Table B-60  
SWMU 10C  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>1</sup>	Cancer Risk
Arsenic	6.74E+00	4.26E-08	0.030	8.62E-09	3.00E-04	2.87E-05	6.09E-09	0.030	1.23E-09	1.50E+00	1.85E-09
					Hazard Index =	2.87E-05					

Table B-61  
SWMU 10C  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $m^3/kg$ )  
VF = Volatilization factor ( $m^3/kg$ ), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ( $(mg/kg-day)^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		
				Intake (mg/kg-day)	RfDi (mg/kg-day)	HQ		Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	6.74E+00	1.03E-02	1.32E+09	5.25E-11	-		1.47E-03	7.49E-12	1.50E+01	1.12E-10
Hazard Index =						0.00E+00	Cancer Risk = 1.12E-10			

Table B-62  
SWMU 10C  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $\text{m}^3/\text{kg}$ )  
VF = Volatilization factor ( $\text{m}^3/\text{kg}$ ), chemical specific  
RfD = Reference Dose ( $\text{mg}/\text{kg}\text{-day}$ )  
SF = Cancer Slope Factor ( $(\text{mg}/\text{kg}\text{-day})^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)			Intake (mg/kg-day)	SFI (mg/kg-day) <sup>1</sup>	
Arsenic	6.74E+00	2.85E-04	1.32E+09	1.46E-12	-		4.08E-05	2.08E-13	1.50E+01	3.12E-12
Hazard Index =						0.00E+00	Cancer Risk =			

**Table B-63**  
**SWMU 10C**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**

**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	6.74E+00	3.23E-06	2.18E-05	3.00E-04	7.25E-02	4.61E-08	3.11E-07	1.50E+00	4.66E-07
Hazard Index =					7.25E-02	Cancer Risk =			

**Table B-64**  
**SWMU 10C**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - CT**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		
			Intake (mg/kg-day)	RfD (mg/kg-day)	HQ		Intake (mg/kg-day)	SF (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	6.74E+00	1.45E-07	9.79E-07	3.00E-04	3.26E-03	2.08E-09	1.40E-08	1.50E+00	2.10E-08
Hazard Index =					3.26E-03	Cancer Risk =			

Table B-65  
SWMU 10C  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>1</sup>	Cancer Risk
Arsenic	6.74E+00	9.69E-06	0.030	1.96E-06	3.00E-04	6.53E-03	1.38E-07	0.030	2.80E-08	1.50E+00	4.20E-08
					Hazard Index =	6.53E-03					

Table B-66  
SWMU 10C  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake	SfD (mg/kg- day) <sup>1</sup>	Cancer Risk	
				Intake (mg/kg- day)					(mg/kg-day)			
Arsenic	6.74E+00	4.36E-07	0.030	8.81E-08	3.00E-04	2.94E-04	6.23E-09	0.030	1.26E-09	1.50E+00	1.89E-09	
Hazard Index =						2.94E-04	Cancer Risk =					1.89E-09

Table B-67  
SWMU 10C  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>2</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)				Intake Factor (m³/kg-day)	Chemical Intake (mg/kg- day)	SFI (mg/kg- day) <sup>-1</sup>	Cancer Risk
				RfDi (mg/kg- day)	HQ					
Arsenic	6.74E+00	2.58E-01	1.32E+09	1.32E-09	-		3.69E-03	1.88E-11	1.50E+01	2.83E-10
Hazard Index =						0.00E+00	Cancer Risk = 2.83E-10			

Table B-68  
SWMU 10C  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $m^3/kg$ )  
VF = Volatilization factor ( $m^3/kg$ ), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ( $(mg/kg-day)^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Chemical				
				Intake (mg/kg-day)	RfDI (mg/kg-day)		Intake Factor (m³/kg-day)	Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk	
Arsenic	6.74E+00	8.81E-03	1.32E+09	4.50E-11	-		1.26E-04	6.42E-13	1.50E+01	9.64E-12	
Zinc	0.00E+00	8.81E-03	1.32E+09	0.00E+00	-		1.26E-04	0.00E+00	-		
Hazard Index =						0.00E+00	Cancer Risk =				9.64E-12

Table B-69  
Summary of Health Risks, SWMU 10C  
DuPont East Chicago Facility  
East Chicago, Indiana

Receptor/Pathway	RME		CT	
	HI	CR	HI	CR
Current/Future Industrial Worker				
Surface Soil Ingestion	2.E-02	4.E-06	2.E-03	1.E-07
Surface Soil Dermal Contact	4.E-03	7.E-07	1.E-03	4.E-08
Inhalation of Air Particulates - Surface Soil	0.E+00	5.E-09	0.E+00	3.E-10
<b>Total</b>	<b>3.E-02</b>	<b>4.E-06</b>	<b>3.E-03</b>	<b>1.E-07</b>
Current/Future Trespasser				
Surface Soil Ingestion	6.E-03	4.E-07	2.E-04	1.E-08
Surface Soil Dermal Contact	1.E-03	7.E-08	3.E-05	2.E-09
Inhalation of Air Particulates - Surface Soil	0.E+00	1.E-10	0.E+00	3.E-12
<b>Total</b>	<b>7.E-03</b>	<b>5.E-07</b>	<b>2.E-04</b>	<b>1.E-08</b>
Future Construction Worker				
Surface Soil Ingestion	7.E-02	5.E-07	3.E-03	2.E-08
Surface Soil Dermal Contact	7.E-03	4.E-08	3.E-04	2.E-09
Inhalation of Air Particulates - Surface Soil	0.E+00	3.E-10	0.E+00	1.E-11
<b>Total</b>	<b>8.E-02</b>	<b>5.E-07</b>	<b>4.E-03</b>	<b>2.E-08</b>

Table B-60  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
Arsenic	4.80E+02	9.78E-07	4.69E-04	3.00E-04	1.56E+00	3.49E-07	1.68E-04	1.50E+00	2.51E-04
Cadmium	2.95E+01	9.78E-07	2.88E-05	5.00E-04	5.77E-02	3.49E-07	1.03E-05	-	
Iron	1.31E+04	9.78E-07	1.29E-02	3.00E-01	4.29E-02	3.49E-07	4.59E-03	-	
Mercury	4.17E+01	9.78E-07	4.08E-05	3.00E-04	1.36E-01	3.49E-07	1.46E-05	-	
Zinc	5.19E+03	9.78E-07	5.08E-03	3.00E-01	1.69E-02	3.49E-07	1.81E-03	-	
					Hazard Index =	1.82E+00			
									Cancer Risk = 2.51E-04

HIs by Target Organ

0.02 Circulatory

1.6 Dermal/Ocular

0.19 Systemic(Kidney)

0.04 Respiratory

Table B-61  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
Arsenic	4.80E+02	1.07E-07	5.14E-05	3.00E-04	1.71E-01	1.01E-08	4.84E-06	1.50E+00	7.27E-06
Cadmium	2.95E+01	1.07E-07	3.16E-06	5.00E-04	6.31E-03	1.01E-08	2.98E-07	-	
Iron	1.31E+04	1.07E-07	1.41E-03	3.00E-01	4.69E-03	1.01E-08	1.33E-04	-	
Mercury	4.17E+01	1.07E-07	4.47E-06	3.00E-04	1.49E-02	1.01E-08	4.21E-07	-	
Zinc	5.19E+03	1.07E-07	5.56E-04	3.00E-01	1.85E-03	1.01E-08	5.24E-05	-	
Hazard Index =					1.99E-01	Cancer Risk = 7.27E-06			

Table B-62  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)			Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk	
					RfD (mg/kg-day)	HQ						
Arsenic	4.80E+02	6.46E-06	0.030	9.29E-05	3.00E-04	3.10E-01	2.31E-06	0.030	3.32E-05	1.50E+00	4.98E-05	
Cadmium	2.95E+01	6.46E-06	0.001	1.90E-07	1.25E-05	1.52E-02	2.31E-06	0.001	6.79E-08	-		
Iron	1.31E+04	6.46E-06	0.010	8.49E-04	3.00E-01	2.83E-03	2.31E-06	0.010	3.03E-04	-		
Mercury	4.17E+01	6.46E-06	0.010	2.69E-06	3.00E-04	8.97E-03	2.31E-06	0.010	9.62E-07	-		
Zinc	5.19E+03	6.46E-06	0.010	3.35E-04	3.00E-01	1.12E-03	2.31E-06	0.010	1.20E-04	-		
Hazard Index =						3.38E-01	Cancer Risk =					4.98E-05

**Table B-63**  
**SWMU 14**  
**DuPont East Chicago Facility**  
**SURFACE SOIL DERMAL CONTACT - CT**  
**Current/Future Industrial Worker**

**Chemical Intake = Conc. x Intake Factor x AB**  
**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

AB = Absorption factor (unitless)  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical			Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg-day)	RfD (mg/kg-day)	HQ					
Arsenic	4.80E+02	1.41E-06	0.030	2.03E-05	3.00E-04	6.78E-02	1.33E-07	0.030	1.92E-06	1.50E+00	2.88E-06
Cadmium	2.95E+01	1.41E-06	0.001	4.17E-08	1.25E-05	3.33E-03	1.33E-07	0.001	3.93E-09	-	
Iron	1.31E+04	1.41E-06	0.010	1.86E-04	3.00E-01	6.20E-04	1.33E-07	0.010	1.75E-05	-	
Mercury	4.17E+01	1.41E-06	0.010	5.90E-07	3.00E-04	1.97E-03	1.33E-07	0.010	5.56E-08	-	
Zinc	5.19E+03	1.41E-06	0.010	7.34E-05	3.00E-01	2.45E-04	1.33E-07	0.010	6.92E-06	-	
Hazard Index =						7.40E-02	Cancer Risk = 2.88E-06				

Table B-64  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk	
				Intake (mg/kg-day)	RfDi (mg/kg-day)	HQ					
Arsenic	4.80E+02	1.96E-01	1.32E+09	7.11E-08	-		shc	6.99E-02	2.54E-08	1.50E+01	3.81E-07
Cadmium	2.95E+01	1.96E-01	1.32E+09	4.37E-09	-		shc	6.99E-02	1.56E-09	6.30E+00	9.83E-09
Iron	1.31E+04	1.96E-01	1.32E+09	1.95E-06	-		shc	6.99E-02	6.96E-07	-	
Mercury	4.17E+01	1.96E-01	1.32E+09	6.18E-09	8.60E-05	7.19E-05	shc	6.99E-02	2.21E-09	-	
Zinc	5.19E+03	1.96E-01	1.32E+09	7.70E-07	-		shc	6.99E-02	2.75E-07	-	
Hazard Index =						7.19E-05	Cancer Risk =				3.91E-07

Table B-65  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $\text{m}^3/\text{kg}$ )  
VF = Volatilization factor ( $\text{m}^3/\text{kg}$ ), chemical specific  
RfD = Reference Dose ( $\text{mg}/\text{kg}\cdot\text{day}$ )  
SF = Cancer Slope Factor ( $(\text{mg}/\text{kg}\cdot\text{day})^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)	HQ		Intake (mg/kg-day)	SFi (mg/kg-day) <sup>-1</sup>	
Arsenic	4.80E+02	4.29E-02	1.32E+09	1.56E-08	-		4.04E-03	1.47E-09	1.50E+01	2.20E-08
Cadmium	2.95E+01	4.29E-02	1.32E+09	9.56E-10	-		4.04E-03	9.02E-11	6.30E+00	5.68E-10
Iron	1.31E+04	4.29E-02	1.32E+09	4.27E-07	-		4.04E-03	4.02E-08	-	
Mercury	4.17E+01	4.29E-02	1.32E+09	1.35E-09	8.60E-05	1.57E-05	4.04E-03	1.28E-10	-	
Zinc	5.19E+03	4.29E-02	1.32E+09	1.69E-07	-		4.04E-03	1.59E-08	-	
Hazard Index =						1.57E-05	Cancer Risk =			2.26E-08

Table B-66  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	4.80E+02	2.74E-07	1.31E-04	3.00E-04	4.38E-01	3.91E-08	1.88E-05	1.50E+00	2.82E-05
Cadmium	2.95E+01	2.74E-07	8.07E-06	5.00E-04	1.61E-02	3.91E-08	1.15E-06	-	
Iron	1.31E+04	2.74E-07	3.60E-03	3.00E-01	1.20E-02	3.91E-08	5.14E-04	-	
Mercury	4.17E+01	2.74E-07	1.14E-05	3.00E-04	3.81E-02	3.91E-08	1.63E-06	-	
Zinc	5.19E+03	2.74E-07	1.42E-03	3.00E-01	4.74E-03	3.91E-08	2.03E-04	-	
Hazard Index =					5.09E-01	Cancer Risk = 2.82E-05			

Table B-67  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	4.80E+02	7.61E-09	3.65E-06	3.00E-04	1.22E-02	1.09E-09	5.21E-07	1.50E+00	7.82E-07
Cadmium	2.95E+01	7.61E-09	2.24E-07	5.00E-04	4.48E-04	1.09E-09	3.20E-08	-	
Iron	1.31E+04	7.61E-09	1.00E-04	3.00E-01	3.33E-04	1.09E-09	1.43E-05	-	
Mercury	4.17E+01	7.61E-09	3.17E-07	3.00E-04	1.06E-03	1.09E-09	4.53E-08	-	
Zinc	5.19E+03	7.61E-09	3.95E-05	3.00E-01	1.32E-04	1.09E-09	5.64E-06	-	
Hazard Index =					1.41E-02	Cancer Risk = 7.82E-07			

Table B-68  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical				Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
			AB	Intake (mg/kg-day)	RfD (mg/kg-day)	HQ					
Arsenic	4.80E+02	1.53E-06	0.030	2.21E-05	3.00E-04	7.36E-02	2.19E-07	0.030	3.15E-06	1.50E+00	4.73E-06
Cadmium	2.95E+01	1.53E-06	0.001	4.52E-08	1.25E-05	3.62E-03	2.19E-07	0.001	6.46E-09	-	
Iron	1.31E+04	1.53E-06	0.010	2.02E-04	3.00E-01	6.72E-04	2.19E-07	0.010	2.88E-05	-	
Mercury	4.17E+01	1.53E-06	0.010	6.40E-07	3.00E-04	2.13E-03	2.19E-07	0.010	9.14E-08	-	
Zinc	5.19E+03	1.53E-06	0.010	7.96E-05	3.00E-01	2.65E-04	2.19E-07	0.010	1.14E-05	-	
Hazard Index =						8.03E-02	Cancer Risk = 4.73E-06				

Table B-69  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	4.80E+02	4.26E-08	0.030	6.13E-07	3.00E-04	2.04E-03	6.09E-09	0.030	8.76E-08	1.50E+00	1.31E-07
Cadmium	2.95E+01	4.26E-08	0.001	1.26E-09	1.25E-05	1.00E-04	6.09E-09	0.001	1.79E-10	-	-
Iron	1.31E+04	4.26E-08	0.010	5.60E-06	3.00E-01	1.87E-05	6.09E-09	0.010	8.00E-07	-	-
Mercury	4.17E+01	4.26E-08	0.010	1.78E-08	3.00E-04	5.92E-05	6.09E-09	0.010	2.54E-09	-	-
Zinc	5.19E+03	4.26E-08	0.010	2.21E-06	3.00E-01	7.37E-06	6.09E-09	0.010	3.16E-07	-	-
					Hazard Index = 2.23E-03		Cancer Risk = 1.31E-07				

Table B-70  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	
Arsenic	4.80E+02	1.03E-02	1.32E+09	3.73E-09	-		1.47E-03	5.33E-10	1.50E+01	8.00E-09
Cadmium	2.95E+01	1.03E-02	1.32E+09	2.29E-10	-		1.47E-03	3.28E-11	6.30E+00	2.06E-10
Iron	1.31E+04	1.03E-02	1.32E+09	1.02E-07	-		1.47E-03	1.46E-08	-	
Mercury	4.17E+01	1.03E-02	1.32E+09	3.24E-10	8.60E-05	3.77E-06	1.47E-03	4.64E-11	-	
Zinc	5.19E+03	1.03E-02	1.32E+09	4.04E-08	-		1.47E-03	5.77E-09	-	
Hazard Index =						3.77E-06	Cancer Risk = 8.21E-09			

Table B-71  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Chemical			Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Intake (mg/kg-day)	SFi (mg/kg-day)⁻¹	
Arsenic	4.80E+02	2.85E-04	1.32E+09	1.04E-10	-		4.08E-05	1.48E-11	1.50E+01	2.22E-10
Cadmium	2.95E+01	2.85E-04	1.32E+09	6.37E-12	-		4.08E-05	9.10E-13	6.30E+00	5.73E-12
Iron	1.31E+04	2.85E-04	1.32E+09	2.84E-09	-		4.08E-05	4.06E-10	-	
Mercury	4.17E+01	2.85E-04	1.32E+09	9.01E-12	8.60E-05	1.05E-07	4.08E-05	1.29E-12	-	
Zinc	5.19E+03	2.85E-04	1.32E+09	1.12E-09	-		4.08E-05	1.60E-10	-	
Hazard Index =						1.05E-07	Cancer Risk =			2.28E-10

**Table B-72**  
**SWMU 14**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	4.80E+02	3.23E-06	1.55E-03	3.00E-04	5.16E+00	4.61E-08	2.21E-05	1.50E+00	3.32E-05
Cadmium	2.95E+01	3.23E-06	9.51E-05	5.00E-04	1.90E-01	4.61E-08	1.36E-06	-	
Iron	1.31E+04	3.23E-06	4.24E-02	3.00E-01	1.41E-01	4.61E-08	6.06E-04	-	
Mercury	4.17E+01	3.23E-06	1.35E-04	3.00E-04	4.49E-01	4.61E-08	1.92E-06	-	
Zinc	5.19E+03	3.23E-06	1.68E-02	3.00E-01	5.59E-02	4.61E-08	2.39E-04	-	
Hazard Index =					6.00E+00	Cancer Risk = 3.32E-05			

**HIs by Target Organ**

5.59E-02 Circulatory  
5.16E+00 Dermal/Ocular  
6.39E-01 Systemic(Kidney)  
1.41E-01 Respiratory

**Table B-73**  
**SWMU 14**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - CT**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>-1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	4.80E+02	1.45E-07	6.97E-05	3.00E-04	2.32E-01	2.08E-09	9.96E-07	1.50E+00	1.49E-06
Cadmium	2.95E+01	1.45E-07	4.28E-06	5.00E-04	8.56E-03	2.08E-09	6.12E-08	-	
Iron	1.31E+04	1.45E-07	1.91E-03	3.00E-01	6.37E-03	2.08E-09	2.73E-05	-	
Mercury	4.17E+01	1.45E-07	6.06E-06	3.00E-04	2.02E-02	2.08E-09	8.65E-08	-	
Zinc	5.19E+03	1.45E-07	7.54E-04	3.00E-01	2.51E-03	2.08E-09	1.08E-05	-	
Hazard Index =					2.70E-01	Cancer Risk = 1.49E-06			

Table B-74  
SWMU 14  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)			Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk	
				RfD (mg/kg-day)	HQ							
Arsenic	4.80E+02	9.69E-06	0.030	1.39E-04	3.00E-04	4.65E-01	1.38E-07	0.030	1.99E-06	1.50E+00	2.99E-06	
Cadmium	2.95E+01	9.69E-06	0.001	2.85E-07	1.25E-05	2.28E-02	1.38E-07	0.001	4.08E-09	-		
Iron	1.31E+04	9.69E-06	0.010	1.27E-03	3.00E-01	4.24E-03	1.38E-07	0.010	1.82E-05	-		
Mercury	4.17E+01	9.69E-06	0.010	4.04E-06	3.00E-04	1.35E-02	1.38E-07	0.010	5.77E-08	-		
Zinc	5.19E+03	9.69E-06	0.010	5.03E-04	3.00E-01	1.68E-03	1.38E-07	0.010	7.18E-06	-		
Hazard Index =						5.07E-01	Cancer Risk =					2.99E-06

**Table B-75**  
**SWMU 14**  
**DuPont East Chicago Facility**  
**SURFACE SOIL DERMAL CONTACT - CT**  
**Future Construction Worker**

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	4.80E+02	4.36E-07	0.030	6.27E-06	3.00E-04	2.09E-02	6.23E-09	0.030	8.96E-08	1.50E+00	1.34E-07
Cadmium	2.95E+01	4.36E-07	0.001	1.28E-08	1.25E-05	1.03E-03	6.23E-09	0.001	1.83E-10	-	
Iron	1.31E+04	4.36E-07	0.010	5.73E-05	3.00E-01	1.91E-04	6.23E-09	0.010	8.18E-07	-	
Mercury	4.17E+01	4.36E-07	0.010	1.82E-07	3.00E-04	6.06E-04	6.23E-09	0.010	2.60E-09	-	
Zinc	5.19E+03	4.36E-07	0.010	2.26E-05	3.00E-01	7.54E-05	6.23E-09	0.010	3.23E-07	-	
Hazard Index =						2.28E-02	Cancer Risk = 1.34E-07				

Table B-76  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Arsenic	4.80E+02	2.58E-01	1.32E+09	9.39E-08	-		3.69E-03	1.34E-09	1.50E+01	2.01E-08
Cadmium	2.95E+01	2.58E-01	1.32E+09	5.77E-09	-		3.69E-03	8.24E-11	6.30E+00	5.19E-10
Mercury	4.17E+01	2.58E-01	1.32E+09	8.16E-09	8.60E-05	9.49E-05	3.69E-03	1.17E-10	-	
Zinc	5.19E+03	2.58E-01	1.32E+09	1.02E-06	-		3.69E-03	1.45E-08	-	
Hazard Index =						9.49E-05	Cancer Risk = 2.06E-08			

Table B-77  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>2</sup>/kg)  
VF = Volatilization factor (m<sup>2</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFi (mg/kg- day)⁻¹	
Arsenic	4.80E+02	8.81E-03	1.32E+09	3.20E-09	-		1.26E-04	4.57E-11	1.50E+01	6.86E-10
Cadmium	2.95E+01	8.81E-03	1.32E+09	1.97E-10	-		1.26E-04	2.81E-12	6.30E+00	1.77E-11
Mercury	4.17E+01	8.81E-03	1.32E+09	2.78E-10	8.60E-05	3.23E-06	1.26E-04	3.97E-12	-	
Trichloroethene	0.00E+00	8.81E-03	3.30E+03	0.00E+00	1.00E-02	0.00E+00	1.26E-04	0.00E+00	4.00E-01	0.00E+00
Zinc	5.19E+03	8.81E-03	1.32E+09	3.46E-08	-		1.26E-04	4.95E-10	-	
Hazard Index =						3.23E-06	Cancer Risk = 7.03E-10			

**Table B-78**  
**SWMU 14**  
**DuPont East Chicago Facility**  
**SUBSURFACE SOIL INGESTION - RME**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**

**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	1.75E+02	3.23E-06	5.65E-04	3.00E-04	1.88E+00	4.61E-08	8.07E-06	1.50E+00	1.21E-05
Cadmium	7.84E+01	3.23E-06	2.53E-04	5.00E-04	5.06E-01	4.61E-08	3.62E-06	-	
Zinc	1.01E+04	3.23E-06	3.26E-02	3.00E-01	1.09E-01	4.61E-08	4.66E-04	-	
Hazard Index =					2.50E+00	Cancer Risk = 1.21E-05			

HIs by Target Organ

0.11 Circulatory

1.9 Dermal/Ocular

0.51 Systemic(Kidney)

**Table B-79**  
**SWMU 14**  
**DuPont East Chicago Facility**  
**SUBSURFACE SOIL INGESTION - CT**  
**Future Construction Worker**

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>-1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Arsenic	1.75E+02	1.45E-07	2.54E-05	3.00E-04	8.48E-02	2.08E-09	3.63E-07	1.50E+00	5.45E-07
Cadmium	7.84E+01	1.45E-07	1.14E-05	5.00E-04	2.28E-02	2.08E-09	1.63E-07	-	
Zinc	1.01E+04	1.45E-07	1.47E-03	3.00E-01	4.89E-03	2.08E-09	2.10E-05	-	
Hazard Index =					1.12E-01	Cancer Risk = 5.45E-07			

Table B-80  
SWMU 14  
DuPont East Chicago Facility  
SUBSURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg-day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg-day)							
Arsenic	1.75E+02	9.69E-06	0.030	5.09E-05	3.00E-04	1.70E-01	1.38E-07	0.030	7.27E-07	1.50E+00	1.09E-06
Cadmium	7.84E+01	9.69E-06	0.001	7.59E-07	1.25E-05	6.08E-02	1.38E-07	0.001	1.08E-08	-	
Zinc	1.01E+04	9.69E-06	0.010	9.78E-04	3.00E-01	3.26E-03	1.38E-07	0.010	1.40E-05	-	
					Hazard Index = 2.34E-01		Cancer Risk = 1.09E-06				

**Table B-81**  
**SWMU 14**  
**DuPont East Chicago Facility**  
**SUBSURFACE SOIL DERMAL CONTACT - CT**  
**Future Construction Worker**

**Chemical Intake = Conc. x Intake Factor x AB**  
**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

AB = Absorption factor (unitless)  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)			HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	1.75E+02	4.36E-07	0.030	2.29E-06	3.00E-04	7.63E-03		6.23E-09	0.030	3.27E-08	1.50E+00	4.90E-08
Cadmium	7.84E+01	4.36E-07	0.001	3.42E-08	1.25E-05	2.73E-03		6.23E-09	0.001	4.88E-10	-	
Zinc	1.01E+04	4.36E-07	0.010	4.40E-05	3.00E-01	1.47E-04		6.23E-09	0.010	6.29E-07	-	
Hazard Index =						1.05E-02	Cancer Risk = 4.90E-08					

Table B-82  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Chemical			
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Intake (mg/kg-day)	SFi (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	1.75E+02	2.58E-01	1.32E+09	3.42E-08	-		3.69E-03	4.89E-10	1.50E+01	7.34E-09
Cadmium	7.84E+01	2.58E-01	1.32E+09	1.53E-08	-		3.69E-03	2.19E-10	6.30E+00	1.38E-09
Zinc	1.01E+04	2.58E-01	1.32E+09	1.98E-06	-		3.69E-03	2.82E-08	-	
Hazard Index =						0.00E+00	Cancer Risk = 8.72E-09			

Table B-83  
SWMU 14  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $m^3/kg$ )  
VF = Volatilization factor ( $m^3/kg$ ), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ( $(mg/kg-day)^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Chemical			
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Intake (mg/kg-day)	SFi (mg/kg-day) <sup>-1</sup>	Cancer Risk
Arsenic	1.75E+02	8.81E-03	1.32E+09	1.17E-09	-		1.26E-04	1.67E-11	1.50E+01	2.50E-10
Cadmium	7.84E+01	8.81E-03	1.32E+09	5.23E-10	-		1.26E-04	7.47E-12	6.30E+00	4.71E-11
Zinc	1.01E+04	8.81E-03	1.32E+09	6.74E-08	-		1.26E-04	9.63E-10	-	
Hazard Index =						0.00E+00	Cancer Risk = 2.97E-10			

Table B-84  
Summary of Health Risks, SWMU 14  
DuPont East Chicago Facility  
East Chicago, Indiana

Receptor/Pathway	RME		CT	
	HI	CR	HI	CR
Current/Future Industrial Worker				
Surface Soil Ingestion	2.E+00	3.E-04	2.E-01	7.E-06
Surface Soil Dermal Contact	3.E-01	5.E-05	7.E-02	3.E-06
Inhalation of Air Particulates - Surface Soil	7.E-05	4.E-07	2.E-05	2.E-08
<b>Total</b>	<b>2.E+00</b>	<b>3.E-04</b>	<b>3.E-01</b>	<b>1.E-05</b>
Current/Future Trespasser				
Surface Soil Ingestion	5.E-01	3.E-05	1.E-02	8.E-07
Surface Soil Dermal Contact	8.E-02	5.E-06	2.E-03	1.E-07
Inhalation of Air Particulates - Surface Soil	4.E-06	8.E-09	1.E-07	2.E-10
<b>Total</b>	<b>6.E-01</b>	<b>3.E-05</b>	<b>2.E-02</b>	<b>9.E-07</b>
Future Construction Worker				
Surface Soil Ingestion	6.E+00	3.E-05	3.E-01	1.E-06
Surface Soil Dermal Contact	5.E-01	3.E-06	2.E-02	1.E-07
Inhalation of Air Particulates - Surface Soil	9.E-05	2.E-08	3.E-06	7.E-10
Subsurface Soil Ingestion	2.E+00	1.E-05	1.E-01	5.E-07
Subsurface Soil Dermal Contact	2.E-01	1.E-06	1.E-02	5.E-08
Inhalation of Air Particulates - Subsurface Soil	0.E+00	9.E-09	0.E+00	3.E-10
<b>Total</b>	<b>9.E+00</b>	<b>5.E-05</b>	<b>4.E-01</b>	<b>2.E-06</b>

Table B-85  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ		Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Antimony	2.09E+01	9.78E-07	2.04E-05	4.00E-04	5.10E-02	3.49E-07	7.29E-06	-	
Arsenic	1.49E+02	9.78E-07	1.46E-04	3.00E-04	4.86E-01	3.49E-07	5.20E-05	1.50E+00	7.81E-05
Barium	5.78E+03	9.78E-07	5.66E-03	7.00E-02	8.08E-02	3.49E-07	2.02E-03	-	
Cadmium	3.16E+01	9.78E-07	3.09E-05	5.00E-04	6.18E-02	3.49E-07	1.10E-05	-	
Chromium	5.60E+01	9.78E-07	5.48E-05	1.50E+00	3.65E-05	3.49E-07	1.96E-05	-	
Iron	3.24E+04	9.78E-07	3.17E-02	3.00E-01	1.06E-01	3.49E-07	1.13E-02	-	
Thallium	2.58E+00	9.78E-07	2.52E-06	6.60E-05	3.82E-02	3.49E-07	9.02E-07	-	
Zinc	3.35E+04	9.78E-07	3.28E-02	3.00E-01	1.09E-01	3.49E-07	1.17E-02	-	
Hazard Index =					9.32E-01	Cancer Risk = 7.81E-05			

Table B-86  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	2.09E+01	1.07E-07	2.24E-06	4.00E-04	5.59E-03	1.01E-08	2.11E-07	-	
Arsenic	1.49E+02	1.07E-07	1.60E-05	3.00E-04	5.32E-02	1.01E-08	1.50E-06	1.50E+00	2.26E-06
Barium	5.78E+03	1.07E-07	6.20E-04	7.00E-02	8.85E-03	1.01E-08	5.84E-05	-	
Cadmium	3.16E+01	1.07E-07	3.39E-06	5.00E-04	6.77E-03	1.01E-08	3.19E-07	-	
Chromium	5.60E+01	1.07E-07	6.00E-06	1.50E+00	4.00E-06	1.01E-08	5.66E-07	-	
Iron	3.24E+04	1.07E-07	3.47E-03	3.00E-01	1.16E-02	1.01E-08	3.27E-04	-	
Thallium	2.58E+00	1.07E-07	2.76E-07	6.60E-05	4.19E-03	1.01E-08	2.61E-08	-	
Zinc	3.35E+04	1.07E-07	3.59E-03	3.00E-01	1.20E-02	1.01E-08	3.38E-04	-	
Hazard Index =					1.02E-01	Cancer Risk = 2.26E-06			

Table B-87  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	2.09E+01	6.46E-06	0.010	1.35E-06	4.00E-04	3.37E-03	2.31E-06	0.010	4.81E-07	-	
Arsenic	1.49E+02	6.46E-06	0.030	2.88E-05	3.00E-04	9.62E-02	2.31E-06	0.030	1.03E-05	1.50E+00	1.55E-05
Barium	5.78E+03	6.46E-06	0.010	3.73E-04	7.00E-02	5.33E-03	2.31E-06	0.010	1.33E-04	-	
Cadmium	3.16E+01	6.46E-06	0.001	2.04E-07	1.25E-05	1.63E-02	2.31E-06	0.001	7.29E-08	-	
Chromium	5.60E+01	6.46E-06	0.010	3.62E-06	1.50E+00	2.41E-06	2.31E-06	0.010	1.29E-06	-	
Iron	3.24E+04	6.46E-06	0.010	2.09E-03	3.00E-01	6.97E-03	2.31E-06	0.010	7.46E-04	-	
Thallium	2.58E+00	6.46E-06	0.010	1.67E-07	6.60E-05	2.52E-03	2.31E-06	0.010	5.95E-08	-	
Zinc	3.35E+04	6.46E-06	0.010	2.16E-03	3.00E-01	7.21E-03	2.31E-06	0.010	7.72E-04	-	
Hazard Index =						1.38E-01	Cancer Risk =				1.55E-05

Table B-88  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	2.09E+01	1.41E-06	0.010	2.95E-07	4.00E-04	7.38E-04	1.33E-07	0.010	2.78E-08	-	
Arsenic	1.49E+02	1.41E-06	0.030	6.32E-06	3.00E-04	2.11E-02	1.33E-07	0.030	5.96E-07	1.50E+00	8.93E-07
Barium	5.78E+03	1.41E-06	0.010	8.18E-05	7.00E-02	1.17E-03	1.33E-07	0.010	7.71E-06	-	
Cadmium	3.16E+01	1.41E-06	0.001	4.47E-08	1.25E-05	3.58E-03	1.33E-07	0.001	4.21E-09	-	
Chromium	5.60E+01	1.41E-06	0.010	7.92E-07	1.50E+00	5.28E-07	1.33E-07	0.010	7.47E-08	-	
Iron	3.24E+04	1.41E-06	0.010	4.58E-04	3.00E-01	1.53E-03	1.33E-07	0.010	4.31E-05	-	
Thallium	2.58E+00	1.41E-06	0.010	3.65E-08	6.60E-05	5.53E-04	1.33E-07	0.010	3.44E-09	-	
Zinc	3.35E+04	1.41E-06	0.010	4.74E-04	3.00E-01	1.58E-03	1.33E-07	0.010	4.46E-05	-	
Hazard Index =						3.02E-02	Cancer Risk =				8.93E-07

Table B-89  
AOC 6  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical			HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)						
Antimony	2.09E+01	1.96E-01	1.32E+09	3.09E-09	-			shc	6.99E-02	1.10E-09	-
Arsenic	1.49E+02	1.96E-01	1.32E+09	2.21E-08	-			shc	6.99E-02	7.88E-09	1.50E+01 1.18E-07
Barium	5.78E+03	1.96E-01	1.32E+09	8.57E-07	1.40E-04	6.12E-03		shc	6.99E-02	3.06E-07	-
Cadmium	3.16E+01	1.96E-01	1.32E+09	4.68E-09	-			shc	6.99E-02	1.67E-09	6.30E+00 1.05E-08
Chromium	5.60E+01	1.96E-01	1.32E+09	8.30E-09	-			shc	6.99E-02	2.97E-09	-
Iron	3.24E+04	1.96E-01	1.32E+09	4.80E-06	-			shc	6.99E-02	1.71E-06	-
Thallium	2.58E+00	1.96E-01	1.32E+09	3.82E-10	-			shc	6.99E-02	1.37E-10	-
Zinc	3.35E+04	1.96E-01	1.32E+09	4.96E-06	-			shc	6.99E-02	1.77E-06	-
					Hazard Index =		6.12E-03	Cancer Risk = 1.29E-07			

Table B-90  
AOC 6  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	
Antimony	2.09E+01	4.29E-02	1.32E+09	6.77E-10	-		4.04E-03	6.39E-11	-	
Arsenic	1.49E+02	4.29E-02	1.32E+09	4.83E-09	-		4.04E-03	4.56E-10	1.50E+01	6.84E-09
Barium	5.78E+03	4.29E-02	1.32E+09	1.88E-07	1.40E-04	1.34E-03	4.04E-03	1.77E-08	-	
Cadmium	3.16E+01	4.29E-02	1.32E+09	1.03E-09	-		4.04E-03	9.67E-11	6.30E+00	6.09E-10
Chromium	5.60E+01	4.29E-02	1.32E+09	1.82E-09	-		4.04E-03	1.71E-10	-	
Iron	3.24E+04	4.29E-02	1.32E+09	1.05E-06	-		4.04E-03	9.91E-08	-	
Thallium	2.58E+00	4.29E-02	1.32E+09	8.38E-11	-		4.04E-03	7.90E-12	-	
Zinc	3.35E+04	4.29E-02	1.32E+09	1.09E-06	-		4.04E-03	1.02E-07	-	
Hazard Index =						1.34E-03	Cancer Risk = 7.45E-09			

Table B-91  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	2.09E+01	2.74E-07	5.72E-06	4.00E-04	1.43E-02	3.91E-08	8.16E-07	-	
Arsenic	1.49E+02	2.74E-07	4.08E-05	3.00E-04	1.36E-01	3.91E-08	5.83E-06	1.50E+00	8.74E-06
Barium	5.78E+03	2.74E-07	1.58E-03	7.00E-02	2.26E-02	3.91E-08	2.26E-04	-	
Cadmium	3.16E+01	2.74E-07	8.66E-06	5.00E-04	1.73E-02	3.91E-08	1.24E-06	-	
Chromium	5.60E+01	2.74E-07	1.53E-05	1.50E+00	1.02E-05	3.91E-08	2.19E-06	-	
Iron	3.24E+04	2.74E-07	8.86E-03	3.00E-01	2.95E-02	3.91E-08	1.27E-03	-	
Thallium	2.58E+00	2.74E-07	7.07E-07	6.60E-05	1.07E-02	3.91E-08	1.01E-07	-	
Zinc	3.35E+04	2.74E-07	9.17E-03	3.00E-01	3.06E-02	3.91E-08	1.31E-03	-	
Hazard Index =					2.61E-01	Cancer Risk = 8.74E-06			

**Table B-92**  
**AOC 6**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - CT**  
**Current/Future Trespasser**

**HQ = Chemical Intake / RfD**

**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	2.09E+01	7.61E-09	1.59E-07	4.00E-04	3.97E-04	1.09E-09	2.27E-08	-	
Arsenic	1.49E+02	7.61E-09	1.13E-06	3.00E-04	3.78E-03	1.09E-09	1.62E-07	1.50E+00	2.43E-07
Barium	5.78E+03	7.61E-09	4.40E-05	7.00E-02	6.29E-04	1.09E-09	6.29E-06	-	
Cadmium	3.16E+01	7.61E-09	2.40E-07	5.00E-04	4.81E-04	1.09E-09	3.44E-08	-	
Chromium	5.60E+01	7.61E-09	4.26E-07	1.50E+00	2.84E-07	1.09E-09	6.09E-08	-	
Iron	3.24E+04	7.61E-09	2.46E-04	3.00E-01	8.21E-04	1.09E-09	3.52E-05	-	
Thallium	2.58E+00	7.61E-09	1.96E-08	6.60E-05	2.97E-04	1.09E-09	2.80E-09	-	
Zinc	3.35E+04	7.61E-09	2.55E-04	3.00E-01	8.49E-04	1.09E-09	3.64E-05	-	
Hazard Index =					7.25E-03	Cancer Risk = 2.43E-07			

Table B-93  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	2.09E+01	1.53E-06	0.010	3.20E-07	4.00E-04	8.00E-04	2.19E-07	0.010	4.57E-08	-	
Arsenic	1.49E+02	1.53E-06	0.030	6.85E-06	3.00E-04	2.28E-02	2.19E-07	0.030	9.79E-07	1.50E+00	1.47E-06
Barium	5.78E+03	1.53E-06	0.010	8.87E-05	7.00E-02	1.27E-03	2.19E-07	0.010	1.27E-05	-	
Cadmium	3.16E+01	1.53E-06	0.001	4.85E-08	1.25E-05	3.88E-03	2.19E-07	0.001	6.93E-09	-	
Chromium	5.60E+01	1.53E-06	0.010	8.59E-07	1.50E+00	5.73E-07	2.19E-07	0.010	1.23E-07	-	
Iron	3.24E+04	1.53E-06	0.010	4.96E-04	3.00E-01	1.65E-03	2.19E-07	0.010	7.09E-05	-	
Thallium	2.58E+00	1.53E-06	0.010	3.96E-08	6.60E-05	6.00E-04	2.19E-07	0.010	5.65E-09	-	
Zinc	3.35E+04	1.53E-06	0.010	5.14E-04	3.00E-01	1.71E-03	2.19E-07	0.010	7.34E-05	-	
Hazard Index =						3.28E-02	Cancer Risk =				1.47E-06

Table B-94  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	2.09E+01	4.26E-08	0.010	8.89E-09	4.00E-04	2.22E-05	6.09E-09	0.010	1.27E-09	-	
Arsenic	1.49E+02	4.26E-08	0.030	1.90E-07	3.00E-04	6.35E-04	6.09E-09	0.030	2.72E-08	1.50E+00	4.08E-08
Barium	5.78E+03	4.26E-08	0.010	2.46E-06	7.00E-02	3.52E-05	6.09E-09	0.010	3.52E-07	-	
Cadmium	3.16E+01	4.26E-08	0.001	1.35E-09	1.25E-05	1.08E-04	6.09E-09	0.001	1.92E-10	-	
Chromium	5.60E+01	4.26E-08	0.010	2.39E-08	1.50E+00	1.59E-08	6.09E-09	0.010	3.41E-09	-	
Iron	3.24E+04	4.26E-08	0.010	1.38E-05	3.00E-01	4.60E-05	6.09E-09	0.010	1.97E-06	-	
Thallium	2.58E+00	4.26E-08	0.010	1.10E-09	6.60E-05	1.67E-05	6.09E-09	0.010	1.57E-10	-	
Zinc	3.35E+04	4.26E-08	0.010	1.43E-05	3.00E-01	4.76E-05	6.09E-09	0.010	2.04E-06	-	
Hazard Index =						9.10E-04	Cancer Risk =				4.08E-08

Table B-95  
AOC 6  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $m^2/kg$ )  
VF = Volatilization factor ( $m^2/kg$ ), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ( $(mg/kg-day)^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m²/kg)	Chemical			HQ	Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg-day)	RfDI (mg/kg-day)				Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	
Antimony	2.09E+01	1.03E-02	1.32E+09	1.62E-10	-			1.47E-03	2.32E-11	-	
Arsenic	1.49E+02	1.03E-02	1.32E+09	1.16E-09	-			1.47E-03	1.66E-10	1.50E+01	2.48E-09
Barium	5.78E+03	1.03E-02	1.32E+09	4.50E-08	1.40E-04	3.21E-04		1.47E-03	6.43E-09	-	
Cadmium	3.16E+01	1.03E-02	1.32E+09	2.46E-10	-			1.47E-03	3.51E-11	6.30E+00	2.21E-10
Chromium	5.60E+01	1.03E-02	1.32E+09	4.36E-10	-			1.47E-03	6.23E-11	-	
Iron	3.24E+04	1.03E-02	1.32E+09	2.52E-07	-			1.47E-03	3.60E-08	-	
Thallium	2.58E+00	1.03E-02	1.32E+09	2.01E-11	-			1.47E-03	2.87E-12	-	
Zinc	3.35E+04	1.03E-02	1.32E+09	2.61E-07	-			1.47E-03	3.72E-08	-	
Hazard Index =						3.21E-04	Cancer Risk =				2.70E-09

Table B-96  
AOC 6  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFI (mg/kg- day)⁻¹	
Antimony	2.09E+01	2.85E-04	1.32E+09	4.51E-12	-	8.93E-06	4.08E-05	6.44E-13	-	6.90E-11
Arsenic	1.49E+02	2.85E-04	1.32E+09	3.22E-11	-		4.08E-05	4.60E-12	1.50E+01	
Barium	5.78E+03	2.85E-04	1.32E+09	1.25E-09	1.40E-04		4.08E-05	1.79E-10	-	
Cadmium	3.16E+01	2.85E-04	1.32E+09	6.83E-12	-		4.08E-05	9.76E-13	6.30E+00	
Chromium	5.60E+01	2.85E-04	1.32E+09	1.21E-11	-		4.08E-05	1.73E-12	-	
Iron	3.24E+04	2.85E-04	1.32E+09	7.00E-09	-		4.08E-05	9.99E-10	-	
Thallium	2.58E+00	2.85E-04	1.32E+09	5.58E-13	-		4.08E-05	7.97E-14	-	
Zinc	3.35E+04	2.85E-04	1.32E+09	7.24E-09	-		4.08E-05	1.03E-09	-	
Hazard Index =						8.93E-06	Cancer Risk =			7.51E-11

**Table B-97**  
**AOC 6**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Future Construction Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg-day)	RfD (mg/kg-day)	HQ		Intake (mg/kg-day)	SF (mg/kg-day) <sup>-1</sup>	
Antimony	2.09E+01	3.23E-06	6.74E-05	4.00E-04	1.68E-01	4.61E-08	9.62E-07	-	
Arsenic	1.49E+02	3.23E-06	4.81E-04	3.00E-04	1.60E+00	4.61E-08	6.87E-06	1.50E+00	1.03E-05
Barium	5.78E+03	3.23E-06	1.87E-02	7.00E-02	2.67E-01	4.61E-08	2.67E-04	-	
Cadmium	3.16E+01	3.23E-06	1.02E-04	5.00E-04	2.04E-01	4.61E-08	1.46E-06	-	
Chromium	5.60E+01	3.23E-06	1.81E-04	1.50E+00	1.21E-04	4.61E-08	2.58E-06	-	
Iron	3.24E+04	3.23E-06	1.04E-01	3.00E-01	3.48E-01	4.61E-08	1.49E-03	-	
Thallium	2.58E+00	3.23E-06	8.33E-06	6.60E-05	1.26E-01	4.61E-08	1.19E-07	-	
Zinc	3.35E+04	3.23E-06	1.08E-01	3.00E-01	3.60E-01	4.61E-08	1.54E-03	-	
Hazard Index =					3.08E+00	Cancer Risk = 1.03E-05			

**HI's by Target Organ**

0.5 Circulatory  
1.6 Dermal/Ocular  
0.6 Systemic  
0.3 Respiratory

**Table B-98**  
**AOC 6**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - CT**  
**Future Construction Worker**

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ		Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Antimony	2.09E+01	1.45E-07	3.03E-06	4.00E-04	7.58E-03	2.08E-09	4.33E-08	-	
Arsenic	1.49E+02	1.45E-07	2.16E-05	3.00E-04	7.21E-02	2.08E-09	3.09E-07	1.50E+00	4.64E-07
Barium	5.78E+03	1.45E-07	8.40E-04	7.00E-02	1.20E-02	2.08E-09	1.20E-05	-	
Cadmium	3.16E+01	1.45E-07	4.59E-06	5.00E-04	9.18E-03	2.08E-09	6.56E-08	-	
Chromium	5.60E+01	1.45E-07	8.14E-06	1.50E+00	5.42E-06	2.08E-09	1.16E-07	-	
Iron	3.24E+04	1.45E-07	4.70E-03	3.00E-01	1.57E-02	2.08E-09	6.72E-05	-	
Thallium	2.58E+00	1.45E-07	3.75E-07	6.60E-05	5.68E-03	2.08E-09	5.36E-09	-	
Zinc	3.35E+04	1.45E-07	4.87E-03	3.00E-01	1.62E-02	2.08E-09	6.95E-05	-	
Hazard Index =					1.38E-01	Cancer Risk = 4.64E-07			

Table B-99  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	2.09E+01	9.69E-06	0.010	2.02E-06	4.00E-04	5.05E-03	1.38E-07	0.010	2.89E-08	-	
Arsenic	1.49E+02	9.69E-06	0.030	4.33E-05	3.00E-04	1.44E-01	1.38E-07	0.030	6.18E-07	1.50E+00	9.27E-07
Barium	5.78E+03	9.69E-06	0.010	5.60E-04	7.00E-02	8.00E-03	1.38E-07	0.010	8.00E-06	-	
Cadmium	3.16E+01	9.69E-06	0.001	3.06E-07	1.25E-05	2.45E-02	1.38E-07	0.001	4.37E-09	-	
Chromium	5.60E+01	9.69E-06	0.010	5.42E-06	1.50E+00	3.62E-06	1.38E-07	0.010	7.75E-08	-	
Iron	3.24E+04	9.69E-06	0.010	3.13E-03	3.00E-01	1.04E-02	1.38E-07	0.010	4.48E-05	-	
Thallium	2.58E+00	9.69E-06	0.010	2.50E-07	6.60E-05	3.79E-03	1.38E-07	0.010	3.57E-09	-	
Zinc	3.35E+04	9.69E-06	0.010	3.24E-03	3.00E-01	1.08E-02	1.38E-07	0.010	4.63E-05	-	
Hazard Index =						2.07E-01	Cancer Risk = 9.27E-07				

Table B-100  
AOC 6  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical	RfD (mg/kg- day)	HQ					
				Intake (mg/kg- day)			Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	2.09E+01	4.36E-07	0.010	9.09E-08	4.00E-04	2.27E-04	6.23E-09	0.010	1.30E-09	-	
Arsenic	1.49E+02	4.36E-07	0.030	1.95E-06	3.00E-04	6.49E-03	6.23E-09	0.030	2.78E-08	1.50E+00	4.17E-08
Barium	5.78E+03	4.36E-07	0.010	2.52E-05	7.00E-02	3.60E-04	6.23E-09	0.010	3.60E-07	-	
Cadmium	3.16E+01	4.36E-07	0.001	1.38E-08	1.25E-05	1.10E-03	6.23E-09	0.001	1.97E-10	-	
Chromium	5.60E+01	4.36E-07	0.010	2.44E-07	1.50E+00	1.63E-07	6.23E-09	0.010	3.49E-09	-	
Iron	3.24E+04	4.36E-07	0.010	1.41E-04	3.00E-01	4.70E-04	6.23E-09	0.010	2.01E-06	-	
Thallium	2.58E+00	4.36E-07	0.010	1.12E-08	6.60E-05	1.70E-04	6.23E-09	0.010	1.61E-10	-	
Zinc	3.35E+04	4.36E-07	0.010	1.46E-04	3.00E-01	4.87E-04	6.23E-09	0.010	2.09E-06	-	
Hazard Index =						9.31E-03	Cancer Risk = 4.17E-08				

Table B-101  
AOC 6  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFI (mg/kg- day)⁻¹	
Antimony	2.09E+01	2.58E-01	1.32E+09	4.08E-09	-	8.08E-03	3.69E-03	5.83E-11	-	6.24E-09
Arsenic	1.49E+02	2.58E-01	1.32E+09	2.91E-08	-		3.69E-03	4.16E-10	1.50E+01	
Barium	5.78E+03	2.58E-01	1.32E+09	1.13E-06	1.40E-04		3.69E-03	1.62E-08	-	
Cadmium	3.16E+01	2.58E-01	1.32E+09	6.18E-09	-		3.69E-03	8.83E-11	6.30E+00	
Chromium	5.60E+01	2.58E-01	1.32E+09	1.10E-08	-		3.69E-03	1.57E-10	-	
Iron	3.24E+04	2.58E-01	1.32E+09	6.33E-06	-		3.69E-03	9.05E-08	-	
Thallium	2.58E+00	2.58E-01	1.32E+09	5.05E-10	-		3.69E-03	7.21E-12	-	
Zinc	3.35E+04	2.58E-01	1.32E+09	6.55E-06	-		3.69E-03	9.36E-08	-	
Hazard Index =						8.08E-03	Cancer Risk = 6.80E-09			

Table B-102  
AOC 6  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	2.09E+01	8.81E-03	1.32E+09	1.39E-10	-		1.26E-04	1.99E-12	-	
Arsenic	1.49E+02	8.81E-03	1.32E+09	9.93E-10	-		1.26E-04	1.42E-11	1.50E+01	2.13E-10
Barium	5.78E+03	8.81E-03	1.32E+09	3.86E-08	1.40E-04	2.76E-04	1.26E-04	5.51E-10	-	
Cadmium	3.16E+01	8.81E-03	1.32E+09	2.11E-10	-		1.26E-04	3.01E-12	6.30E+00	1.90E-11
Chromium	5.60E+01	8.81E-03	1.32E+09	3.74E-10	-		1.26E-04	5.34E-12	-	
Iron	3.24E+04	8.81E-03	1.32E+09	2.16E-07	-		1.26E-04	3.08E-09	-	
Thallium	2.58E+00	8.81E-03	1.32E+09	1.72E-11	-		1.26E-04	2.46E-13	-	
Zinc	3.35E+04	8.81E-03	1.32E+09	2.23E-07	-		1.26E-04	3.19E-09	-	
Hazard Index =						2.76E-04	Cancer Risk = 2.32E-10			

Table B-103  
Summary of Health Risks, AOC 6  
DuPont East Chicago Facility  
East Chicago, Indiana

Receptor/Pathway	RME		CT	
	HI	CR	HI	CR
Current/Future Industrial Worker				
Surface Soil Ingestion	9.E-01	8.E-05	1.E-01	2.E-06
Surface Soil Dermal Contact	1.E-01	2.E-05	3.E-02	9.E-07
Inhalation of Air Particulates - Surface Soil	6.E-03	1.E-07	1.E-03	7.E-09
<b>Total</b>	<b>1.E+00</b>	<b>9.E-05</b>	<b>1.E-01</b>	<b>3.E-06</b>
Current/Future Trespasser				
Surface Soil Ingestion	3.E-01	9.E-06	7.E-03	2.E-07
Surface Soil Dermal Contact	3.E-02	1.E-06	9.E-04	4.E-08
Inhalation of Air Particulates - Surface Soil	3.E-04	3.E-09	9.E-06	8.E-11
<b>Total</b>	<b>3.E-01</b>	<b>1.E-05</b>	<b>8.E-03</b>	<b>3.E-07</b>
Future Construction Worker				
Surface Soil Ingestion	3.E+00	1.E-05	1.E-01	5.E-07
Surface Soil Dermal Contact	2.E-01	9.E-07	9.E-03	4.E-08
Inhalation of Air Particulates - Surface Soil	8.E-03	7.E-09	3.E-04	2.E-10
<b>Total</b>	<b>3.E+00</b>	<b>1.E-05</b>	<b>1.E-01</b>	<b>5.E-07</b>

**Table B-104**  
**AOC 12**  
**DuPont East Chicago Facility**  
**SURFACE SOIL INGESTION - RME**  
**Current/Future Industrial Worker**

**HQ = Chemical Intake / RfD**  
**CR = Chemical Intake x SF**

**Where:**

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ		Intake (mg/kg- day)	SF (mg/kg-day) 1	
Antimony	1.38E+02	9.78E-07	1.35E-04	4.00E-04	3.36E-01	3.49E-07	4.81E-05	-	
Arsenic	8.99E+01	9.78E-07	8.80E-05	3.00E-04	2.93E-01	3.49E-07	3.14E-05	1.50E+00	4.71E-05
Cadmium	4.98E+02	9.78E-07	4.87E-04	5.00E-04	9.74E-01	3.49E-07	1.74E-04	-	
Copper	8.25E+02	9.78E-07	8.07E-04	4.00E-02	2.02E-02	3.49E-07	2.88E-04	-	
Iron	3.21E+04	9.78E-07	3.14E-02	3.00E-01	1.05E-01	3.49E-07	1.12E-02	-	
Manganese	6.80E+02	9.78E-07	6.65E-04	2.40E-02	2.77E-02	3.49E-07	2.37E-04	-	
Mercury	2.13E+01	9.78E-07	2.08E-05	3.00E-04	6.95E-02	3.49E-07	7.44E-06	-	
Zinc	1.73E+04	9.78E-07	1.69E-02	3.00E-01	5.64E-02	3.49E-07	6.04E-03	-	
Hazard Index =					1.88E+00	Cancer Risk = 4.71E-05			

HIs by Target Organ

0.4 Circulatory  
0.3 Dermal/Ocular  
1.0 Systemic  
0.1 Respiratory  
0.02 GI  
0.03 Neurological

Table B-105  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	1.38E+02	1.07E-07	1.47E-05	4.00E-04	3.68E-02	1.01E-08	1.39E-06	-	
Arsenic	8.99E+01	1.07E-07	9.63E-06	3.00E-04	3.21E-02	1.01E-08	9.08E-07	1.50E+00	1.36E-06
Cadmium	4.98E+02	1.07E-07	5.33E-05	5.00E-04	1.07E-01	1.01E-08	5.03E-06	-	
Copper	8.25E+02	1.07E-07	8.83E-05	4.00E-02	2.21E-03	1.01E-08	8.33E-06	-	
Iron	3.21E+04	1.07E-07	3.44E-03	3.00E-01	1.15E-02	1.01E-08	3.24E-04	-	
Manganese	6.80E+02	1.07E-07	7.28E-05	2.40E-02	3.03E-03	1.01E-08	6.87E-06	-	
Mercury	2.13E+01	1.07E-07	2.28E-06	3.00E-04	7.61E-03	1.01E-08	2.15E-07	-	
Zinc	1.73E+04	1.07E-07	1.85E-03	3.00E-01	6.17E-03	1.01E-08	1.75E-04	-	
Hazard Index =					2.06E-01	Cancer Risk = 1.36E-06			

Table B-106  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.38E+02	6.46E-06	0.010	8.88E-06	4.00E-04	2.22E-02	2.31E-06	0.010	3.17E-06	-	
Arsenic	8.99E+01	6.46E-06	0.030	1.74E-05	3.00E-04	5.81E-02	2.31E-06	0.030	6.22E-06	1.50E+00	9.33E-06
Cadmium	4.98E+02	6.46E-06	0.001	3.21E-06	1.25E-05	2.57E-01	2.31E-06	0.001	1.15E-06	-	
Copper	8.25E+02	6.46E-06	0.010	5.32E-05	4.00E-02	1.33E-03	2.31E-06	0.010	1.90E-05	-	
Iron	3.21E+04	6.46E-06	0.010	2.07E-03	3.00E-01	6.91E-03	2.31E-06	0.010	7.40E-04	-	
Manganese	6.80E+02	6.46E-06	0.010	4.39E-05	2.40E-02	1.83E-03	2.31E-06	0.010	1.57E-05	-	
Mercury	2.13E+01	6.46E-06	0.010	1.38E-06	3.00E-04	4.59E-03	2.31E-06	0.010	4.91E-07	-	
Zinc	1.73E+04	6.46E-06	0.010	1.12E-03	3.00E-01	3.72E-03	2.31E-06	0.010	3.99E-04	-	
Hazard Index =						3.56E-01	Cancer Risk =				9.33E-06

Table B-107  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Industrial Worker

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk	
Antimony	1.38E+02	1.41E-06	0.010	1.94E-06	4.00E-04	4.86E-03	1.33E-07	0.010	1.83E-07	-		
Arsenic	8.99E+01	1.41E-06	0.030	3.81E-06	3.00E-04	1.27E-02	1.33E-07	0.030	3.60E-07	1.50E+00	5.39E-07	
Cadmium	4.98E+02	1.41E-06	0.001	7.04E-07	1.25E-05	5.63E-02	1.33E-07	0.001	6.64E-08	-		
Copper	8.25E+02	1.41E-06	0.010	1.17E-05	4.00E-02	2.92E-04	1.33E-07	0.010	1.10E-06	-		
Iron	3.21E+04	1.41E-06	0.010	4.54E-04	3.00E-01	1.51E-03	1.33E-07	0.010	4.28E-05	-		
Manganese	6.80E+02	1.41E-06	0.010	9.61E-06	2.40E-02	4.00E-04	1.33E-07	0.010	9.06E-07	-		
Mercury	2.13E+01	1.41E-06	0.010	3.01E-07	3.00E-04	1.00E-03	1.33E-07	0.010	2.84E-08	-		
Zinc	1.73E+04	1.41E-06	0.010	2.44E-04	3.00E-01	8.15E-04	1.33E-07	0.010	2.31E-05	-		
Hazard Index =						7.79E-02	Cancer Risk =					5.39E-07

Table B-108  
AOC 12  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical			HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)						
Antimony	1.38E+02	1.96E-01	1.32E+09	2.04E-08	-			shc	6.99E-02	7.28E-09	-
Arsenic	8.99E+01	1.96E-01	1.32E+09	1.33E-08	-			shc	6.99E-02	4.76E-09	1.50E+01
Cadmium	4.98E+02	1.96E-01	1.32E+09	7.38E-08	-			shc	6.99E-02	2.63E-08	6.30E+00
Copper	8.25E+02	1.96E-01	1.32E+09	1.22E-07	-			shc	6.99E-02	4.37E-08	-
Iron	3.21E+04	1.96E-01	1.32E+09	4.76E-06	-			shc	6.99E-02	1.70E-06	-
Manganese	6.80E+02	1.96E-01	1.32E+09	1.01E-07	1.40E-05	7.20E-03		shc	6.99E-02	3.60E-08	-
Mercury	2.13E+01	1.96E-01	1.32E+09	3.16E-09	8.60E-05	3.67E-05		shc	6.99E-02	1.13E-09	-
Zinc	1.73E+04	1.96E-01	1.32E+09	2.56E-06	-			shc	6.99E-02	9.15E-07	-
Hazard Index =					7.23E-03		Cancer Risk = 2.37E-07				

Table B-109  
AOC 12  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Industrial Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ	Chemical				
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Intake (mg/kg-day)	SFI (mg/kg-day)⁻¹	Cancer Risk	
Antimony	1.38E+02	4.29E-02	1.32E+09	4.46E-09	-		4.04E-03	4.21E-10	-		
Arsenic	8.99E+01	4.29E-02	1.32E+09	2.92E-09	-		4.04E-03	2.75E-10	1.50E+01	4.13E-09	
Cadmium	4.98E+02	4.29E-02	1.32E+09	1.62E-08	-		4.04E-03	1.52E-09	6.30E+00	9.60E-09	
Copper	8.25E+02	4.29E-02	1.32E+09	2.68E-08	-		4.04E-03	2.52E-09	-		
Iron	3.21E+04	4.29E-02	1.32E+09	1.04E-06	-		4.04E-03	9.82E-08	-		
Manganese	6.80E+02	4.29E-02	1.32E+09	2.21E-08	1.40E-05	1.58E-03	4.04E-03	2.08E-09	-		
Mercury	2.13E+01	4.29E-02	1.32E+09	6.92E-10	8.60E-05	8.04E-06	4.04E-03	6.52E-11	-		
Zinc	1.73E+04	4.29E-02	1.32E+09	5.61E-07	-		4.04E-03	5.29E-08	-		
Hazard Index =						1.58E-03	Cancer Risk =				1.37E-08

Table B-110  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			HQ	Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg-day)	RfD (mg/kg-day)				Intake (mg/kg-day)	SF (mg/kg-day) <sup>1</sup>	
Antimony	1.38E+02	2.74E-07	3.77E-05	4.00E-04	9.42E-02	3.91E-08	5.38E-06	-		
Arsenic	8.99E+01	2.74E-07	2.46E-05	3.00E-04	8.21E-02	3.91E-08	3.52E-06	1.50E+00	5.28E-06	
Cadmium	4.98E+02	2.74E-07	1.36E-04	5.00E-04	2.73E-01	3.91E-08	1.95E-05	-		
Copper	8.25E+02	2.74E-07	2.26E-04	4.00E-02	5.65E-03	3.91E-08	3.23E-05	-		
Iron	3.21E+04	2.74E-07	8.79E-03	3.00E-01	2.93E-02	3.91E-08	1.26E-03	-		
Manganese	6.80E+02	2.74E-07	1.86E-04	2.40E-02	7.76E-03	3.91E-08	2.66E-05	-		
Mercury	2.13E+01	2.74E-07	5.84E-06	3.00E-04	1.95E-02	3.91E-08	8.34E-07	-		
Zinc	1.73E+04	2.74E-07	4.74E-03	3.00E-01	1.58E-02	3.91E-08	6.77E-04	-		
Hazard Index =					5.27E-01	Cancer Risk = 5.28E-06				

Table B-111  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ		Intake (mg/kg- day)	SF (mg/kg-day) 1	
Antimony	1.38E+02	7.61E-09	1.05E-06	4.00E-04	2.62E-03	1.09E-09	1.49E-07	-	
Arsenic	8.99E+01	7.61E-09	6.84E-07	3.00E-04	2.28E-03	1.09E-09	9.77E-08	1.50E+00	1.47E-07
Cadmium	4.98E+02	7.61E-09	3.79E-06	5.00E-04	7.57E-03	1.09E-09	5.41E-07	-	
Copper	8.25E+02	7.61E-09	6.27E-06	4.00E-02	1.57E-04	1.09E-09	8.96E-07	-	
Iron	3.21E+04	7.61E-09	2.44E-04	3.00E-01	8.14E-04	1.09E-09	3.49E-05	-	
Manganese	6.80E+02	7.61E-09	5.17E-06	2.40E-02	2.15E-04	1.09E-09	7.39E-07	-	
Mercury	2.13E+01	7.61E-09	1.62E-07	3.00E-04	5.40E-04	1.09E-09	2.32E-08	-	
Zinc	1.73E+04	7.61E-09	1.32E-04	3.00E-01	4.39E-04	1.09E-09	1.88E-05	-	
					Hazard Index =	1.46E-02	Cancer Risk =		
							1.47E-07		

Table B-112  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.38E+02	1.53E-06	0.010	2.11E-06	4.00E-04	5.27E-03	2.19E-07	0.010	3.01E-07	-	
Arsenic	8.99E+01	1.53E-06	0.030	4.14E-06	3.00E-04	1.38E-02	2.19E-07	0.030	5.91E-07	1.50E+00	8.87E-07
Cadmium	4.98E+02	1.53E-06	0.001	7.63E-07	1.25E-05	6.11E-02	2.19E-07	0.001	1.09E-07	-	
Copper	8.25E+02	1.53E-06	0.010	1.26E-05	4.00E-02	3.16E-04	2.19E-07	0.010	1.81E-06	-	
Iron	3.21E+04	1.53E-06	0.010	4.92E-04	3.00E-01	1.64E-03	2.19E-07	0.010	7.03E-05	-	
Manganese	6.80E+02	1.53E-06	0.010	1.04E-05	2.40E-02	4.34E-04	2.19E-07	0.010	1.49E-06	-	
Mercury	2.13E+01	1.53E-06	0.010	3.27E-07	3.00E-04	1.09E-03	2.19E-07	0.010	4.67E-08	-	
Zinc	1.73E+04	1.53E-06	0.010	2.65E-04	3.00E-01	8.84E-04	2.19E-07	0.010	3.79E-05	-	
Hazard Index =						8.45E-02	Cancer Risk = 8.87E-07				

Table B-113  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Current/Future Trespasser

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical				Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk	
			AB	Intake (mg/kg-day)	RfD (mg/kg-day)	HQ						
Antimony	1.38E+02	4.26E-08	0.010	5.86E-08	4.00E-04	1.46E-04	6.09E-09	0.010	8.37E-09	-		
Arsenic	8.99E+01	4.26E-08	0.030	1.15E-07	3.00E-04	3.83E-04	6.09E-09	0.030	1.64E-08	1.50E+00	2.46E-08	
Cadmium	4.98E+02	4.26E-08	0.001	2.12E-08	1.25E-05	1.70E-03	6.09E-09	0.001	3.03E-09	-		
Copper	8.25E+02	4.26E-08	0.010	3.51E-07	4.00E-02	8.78E-06	6.09E-09	0.010	5.02E-08	-		
Iron	3.21E+04	4.26E-08	0.010	1.37E-05	3.00E-01	4.56E-05	6.09E-09	0.010	1.95E-06	-		
Manganese	6.80E+02	4.26E-08	0.010	2.90E-07	2.40E-02	1.21E-05	6.09E-09	0.010	4.14E-08	-		
Mercury	2.13E+01	4.26E-08	0.010	9.08E-09	3.00E-04	3.03E-05	6.09E-09	0.010	1.30E-09	-		
Zinc	1.73E+04	4.26E-08	0.010	7.37E-06	3.00E-01	2.46E-05	6.09E-09	0.010	1.05E-06	-		
Hazard Index =						2.35E-03	Cancer Risk =					2.46E-08

Table B-114  
AOC 12  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk	
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFi (mg/kg- day)⁻¹		
Antimony	1.38E+02	1.03E-02	1.32E+09	1.07E-09	-		1.47E-03	1.53E-10	-		
Arsenic	8.99E+01	1.03E-02	1.32E+09	7.00E-10	-		1.47E-03	1.00E-10	1.50E+01	1.50E-09	
Cadmium	4.98E+02	1.03E-02	1.32E+09	3.87E-09	-		1.47E-03	5.53E-10	6.30E+00	3.49E-09	
Copper	8.25E+02	1.03E-02	1.32E+09	6.42E-09	-		1.47E-03	9.17E-10	-		
Iron	3.21E+04	1.03E-02	1.32E+09	2.50E-07	-		1.47E-03	3.57E-08	-		
Manganese	6.80E+02	1.03E-02	1.32E+09	5.29E-09	1.40E-05	3.78E-04	1.47E-03	7.56E-10	-		
Mercury	2.13E+01	1.03E-02	1.32E+09	1.66E-10	8.60E-05	1.93E-06	1.47E-03	2.37E-11	-		
Zinc	1.73E+04	1.03E-02	1.32E+09	1.35E-07	-		1.47E-03	1.92E-08	-		
Hazard Index =						3.80E-04	Cancer Risk =				4.99E-09

Table B-115  
AOC 12  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Trespasser

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ		Intake (mg/kg- day)	SFi (mg/kg- day)⁻¹	
Antimony	1.38E+02	2.85E-04	1.32E+09	2.97E-11	-		4.08E-05	4.25E-12	-	
Arsenic	8.99E+01	2.85E-04	1.32E+09	1.94E-11	-		4.08E-05	2.78E-12	1.50E+01	4.16E-11
Cadmium	4.98E+02	2.85E-04	1.32E+09	1.08E-10	-		4.08E-05	1.54E-11	6.30E+00	9.68E-11
Copper	8.25E+02	2.85E-04	1.32E+09	1.78E-10	-		4.08E-05	2.55E-11	-	
Iron	3.21E+04	2.85E-04	1.32E+09	6.94E-09	-		4.08E-05	9.91E-10	-	
Manganese	6.80E+02	2.85E-04	1.32E+09	1.47E-10	1.40E-05	1.05E-05	4.08E-05	2.10E-11	-	
Mercury	2.13E+01	2.85E-04	1.32E+09	4.61E-12	8.60E-05	5.35E-08	4.08E-05	6.58E-13	-	
Zinc	1.73E+04	2.85E-04	1.32E+09	3.74E-09	-		4.08E-05	5.34E-10	-	
Hazard Index =						1.05E-05	Cancer Risk = 1.38E-10			

Table B-116  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			HQ	Chemical			Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) 1	
Antimony	1.38E+02	3.23E-06	4.44E-04	4.00E-04	1.11E+00	4.61E-08	6.34E-06	-	6.22E-06	
Arsenic	8.99E+01	3.23E-06	2.90E-04	3.00E-04	9.68E-01	4.61E-08	4.15E-06	1.50E+00		
Cadmium	4.98E+02	3.23E-06	1.61E-03	5.00E-04	3.21E+00	4.61E-08	2.30E-05	-		
Copper	8.25E+02	3.23E-06	2.66E-03	4.00E-02	6.66E-02	4.61E-08	3.80E-05	-		
Iron	3.21E+04	3.23E-06	1.04E-01	3.00E-01	3.45E-01	4.61E-08	1.48E-03	-		
Manganese	6.80E+02	3.23E-06	2.19E-03	2.40E-02	9.14E-02	4.61E-08	3.13E-05	-		
Mercury	2.13E+01	3.23E-06	6.88E-05	3.00E-04	2.29E-01	4.61E-08	9.83E-07	-		
Zinc	1.73E+04	3.23E-06	5.58E-02	3.00E-01	1.86E-01	4.61E-08	7.97E-04	-		
Hazard Index =					6.21E+00	Cancer Risk =				

HIs by Target Organ

1.3 Circulatory  
1.0 Dermal/Ocular  
3.4 Systemic  
0.3 Respiratory  
0.07 GI  
0.09 Neurological

Table B-117  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Future Construction Worker

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical		Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ		Intake (mg/kg- day)	SF (mg/kg-day) <sup>1</sup>	
Antimony	1.38E+02	1.45E-07	2.00E-05	4.00E-04	4.99E-02	2.08E-09	2.85E-07	-	
Arsenic	8.99E+01	1.45E-07	1.31E-05	3.00E-04	4.35E-02	2.08E-09	1.87E-07	1.50E+00	2.80E-07
Cadmium	4.98E+02	1.45E-07	7.23E-05	5.00E-04	1.45E-01	2.08E-09	1.03E-06	-	
Copper	8.25E+02	1.45E-07	1.20E-04	4.00E-02	3.00E-03	2.08E-09	1.71E-06	-	
Iron	3.21E+04	1.45E-07	4.66E-03	3.00E-01	1.55E-02	2.08E-09	6.66E-05	-	
Manganese	6.80E+02	1.45E-07	9.87E-05	2.40E-02	4.11E-03	2.08E-09	1.41E-06	-	
Mercury	2.13E+01	1.45E-07	3.09E-06	3.00E-04	1.03E-02	2.08E-09	4.42E-08	-	
Zinc	1.73E+04	1.45E-07	2.51E-03	3.00E-01	8.37E-03	2.08E-09	3.59E-05	-	
Hazard Index =					2.79E-01	Cancer Risk = 2.80E-07			

Table B-118  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.38E+02	9.69E-06	0.010	1.33E-05	4.00E-04	3.33E-02	1.38E-07	0.010	1.90E-07	-	
Arsenic	8.99E+01	9.69E-06	0.030	2.61E-05	3.00E-04	8.71E-02	1.38E-07	0.030	3.73E-07	1.50E+00	5.60E-07
Cadmium	4.98E+02	9.69E-06	0.001	4.82E-06	1.25E-05	3.86E-01	1.38E-07	0.001	6.89E-08	-	
Copper	8.25E+02	9.69E-06	0.010	7.99E-05	4.00E-02	2.00E-03	1.38E-07	0.010	1.14E-06	-	
Iron	3.21E+04	9.69E-06	0.010	3.11E-03	3.00E-01	1.04E-02	1.38E-07	0.010	4.44E-05	-	
Manganese	6.80E+02	9.69E-06	0.010	6.58E-05	2.40E-02	2.74E-03	1.38E-07	0.010	9.40E-07	-	
Mercury	2.13E+01	9.69E-06	0.010	2.06E-06	3.00E-04	6.88E-03	1.38E-07	0.010	2.95E-08	-	
Zinc	1.73E+04	9.69E-06	0.010	1.67E-03	3.00E-01	5.58E-03	1.38E-07	0.010	2.39E-05	-	
						Hazard Index = 5.34E-01					
										Cancer Risk =	5.60E-07

Table B-119  
AOC 12  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - CT  
Future Construction Worker

Chemical Intake = Conc. x Intake Factor x AB  
 HQ = Chemical Intake / RfD  
 CR = Chemical Intake x SF

**Where:**

AB = Absorption factor (unitless)  
 RfD = Reference Dose (mg/kg-day)  
 SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
 HQ = Hazard Quotient for noncancer effects  
 CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical				Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg-day) <sup>-1</sup>	Cancer Risk	
			AB	Intake (mg/kg-day)	RfD (mg/kg-day)	HQ						
Antimony	1.38E+02	4.36E-07	0.010	5.99E-07	4.00E-04	1.50E-03	6.23E-09	0.010	8.56E-09	-		
Arsenic	8.99E+01	4.36E-07	0.030	1.18E-06	3.00E-04	3.92E-03	6.23E-09	0.030	1.68E-08	1.50E+00	2.52E-08	
Cadmium	4.98E+02	4.36E-07	0.001	2.17E-07	1.25E-05	1.74E-02	6.23E-09	0.001	3.10E-09	-		
Copper	8.25E+02	4.36E-07	0.010	3.59E-06	4.00E-02	8.99E-05	6.23E-09	0.010	5.13E-08	-		
Iron	3.21E+04	4.36E-07	0.010	1.40E-04	3.00E-01	4.66E-04	6.23E-09	0.010	2.00E-06	-		
Manganese	6.80E+02	4.36E-07	0.010	2.96E-06	2.40E-02	1.23E-04	6.23E-09	0.010	4.23E-08	-		
Mercury	2.13E+01	4.36E-07	0.010	9.28E-08	3.00E-04	3.09E-04	6.23E-09	0.010	1.33E-09	-		
Zinc	1.73E+04	4.36E-07	0.010	7.54E-05	3.00E-01	2.51E-04	6.23E-09	0.010	1.08E-06	-		
Hazard Index =						2.40E-02	Cancer Risk =					2.52E-08

Table B-120  
AOC 12  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - RME  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical		HQ				
				Intake (mg/kg-day)	RfDi (mg/kg-day)		Intake Factor (m³/kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day)⁻¹	Cancer Risk
Antimony	1.38E+02	2.58E-01	1.32E+09	2.69E-08	-		3.69E-03	3.84E-10	-	
Arsenic	8.99E+01	2.58E-01	1.32E+09	1.76E-08	-		3.69E-03	2.51E-10	1.50E+01	3.77E-09
Cadmium	4.98E+02	2.58E-01	1.32E+09	9.74E-08	-		3.69E-03	1.39E-09	6.30E+00	8.76E-09
Copper	8.25E+02	2.58E-01	1.32E+09	1.61E-07	-		3.69E-03	2.31E-09	-	
Iron	3.21E+04	2.58E-01	1.32E+09	6.28E-06	-		3.69E-03	8.97E-08	-	
Manganese	6.80E+02	2.58E-01	1.32E+09	1.33E-07	1.40E-05	9.50E-03	3.69E-03	1.90E-09	-	
Mercury	2.13E+01	2.58E-01	1.32E+09	4.17E-09	8.60E-05	4.85E-05	3.69E-03	5.95E-11	-	
Zinc	1.73E+04	2.58E-01	1.32E+09	3.38E-06	-		3.69E-03	4.83E-08	-	
Hazard Index =						9.55E-03	Cancer Risk = 1.25E-08			

Table B-121  
AOC 12  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Future Construction Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor ( $\text{m}^3/\text{kg}$ )  
VF = Volatilization factor ( $\text{m}^3/\text{kg}$ ), chemical specific  
RfD = Reference Dose ( $\text{mg}/\text{kg}\text{-day}$ )  
SF = Cancer Slope Factor ( $(\text{mg}/\text{kg}\text{-day})^{-1}$ )  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor ( $\text{m}^3/\text{kg}\text{-day}$ )	PEF or VF ( $\text{m}^3/\text{kg}$ )	Chemical Intake (mg/kg- day)	RfDi (mg/kg- day)	HQ	Intake Factor ( $\text{m}^3/\text{kg}\text{-day}$ )	Chemical Intake (mg/kg- day)	SFi (mg/kg- day) <sup>-1</sup>	Cancer Risk
Antimony	1.38E+02	8.81E-03	1.32E+09	9.17E-10	-		1.26E-04	1.31E-11	-	
Arsenic	8.99E+01	8.81E-03	1.32E+09	6.00E-10	-		1.26E-04	8.57E-12	1.50E+01	1.29E-10
Cadmium	4.98E+02	8.81E-03	1.32E+09	3.32E-09	-		1.26E-04	4.74E-11	6.30E+00	2.99E-10
Copper	8.25E+02	8.81E-03	1.32E+09	5.50E-09	-		1.26E-04	7.86E-11	-	
Iron	3.21E+04	8.81E-03	1.32E+09	2.14E-07	-		1.26E-04	3.06E-09	-	
Manganese	6.80E+02	8.81E-03	1.32E+09	4.53E-09	1.40E-05	3.24E-04	1.26E-04	6.48E-11	-	
Mercury	2.13E+01	8.81E-03	1.32E+09	1.42E-10	8.60E-05	1.65E-06	1.26E-04	2.03E-12	-	
Zinc	1.73E+04	8.81E-03	1.32E+09	1.15E-07	-		1.26E-04	1.65E-09	-	
Hazard Index =						3.26E-04	Cancer Risk = 4.27E-10			

Table B-122  
Summary of Health Risks, AOC 12  
DuPont East Chicago Facility  
East Chicago, Indiana

Receptor/Pathway	RME		CT	
	HI	CR	HI	CR
Current/Future Industrial Worker				
Surface Soil Ingestion	2.E+00	5.E-05	2.E-01	1.E-06
Surface Soil Dermal Contact	4.E-01	9.E-06	8.E-02	5.E-07
Inhalation of Air Particulates - Surface Soil	7.E-03	2.E-07	2.E-03	1.E-08
<b>Total</b>	<b>2.E+00</b>	<b>6.E-05</b>	<b>3.E-01</b>	<b>2.E-06</b>
Current/Future Trespasser				
Surface Soil Ingestion	5.E-01	5.E-06	1.E-02	1.E-07
Surface Soil Dermal Contact	8.E-02	9.E-07	2.E-03	2.E-08
Inhalation of Air Particulates - Surface Soil	4.E-04	5.E-09	1.E-05	1.E-10
<b>Total</b>	<b>6.E-01</b>	<b>6.E-06</b>	<b>2.E-02</b>	<b>2.E-07</b>
Future Construction Worker				
Surface Soil Ingestion	6.E+00	6.E-06	3.E-01	3.E-07
Surface Soil Dermal Contact	5.E-01	6.E-07	2.E-02	3.E-08
Inhalation of Air Particulates - Surface Soil	1.E-02	1.E-08	3.E-04	4.E-10
<b>Total</b>	<b>7.E+00</b>	<b>7.E-06</b>	<b>3.E-01</b>	<b>3.E-07</b>

**APPENDIX C**  
**NATURAL AREA BUFFER ZONE UPDATED RISK ESTIMATES**

Table C-1  
Constituents of Potential Concern in Surface Soil  
Fenceline  
DuPont East Chicago Facility

Analyte	CAS NO	Units	Number of Samples	Number of Detects	Average Detection	Maximum Detection	USEPA Region IX PRG Ind. Soil <sup>2</sup> HQ=0.1	COPC Y/N?
ANTIMONY	7440360	mg/kg	23	23	5.30E+01	4.00E+02	4.10E+01	Yes
ARSENIC	7440382	mg/kg	23	22	4.32E+01	4.33E+02	1.60E-01	Yes
BARIUM	7440393	mg/kg	23	23	7.40E+01	3.90E+02	6.70E+03	No
BERYLLIUM	7440417	mg/kg	23	17	2.36E-01	1.99E+00	1.90E+02	No
CADMIUM	7440439	mg/kg	23	23	2.57E+02	3.66E+03	4.50E+01	Yes
CHROMIUM	7440473	mg/kg	23	22	1.30E+01	4.23E+01	4.50E+01	No
COBALT	7440484	mg/kg	23	22	4.92E+00	5.08E+01	1.90E+02	No
COPPER	7440508	mg/kg	23	23	3.74E+02	4.47E+03	4.10E+03	Yes
IRON	7439896	mg/kg	23	23	1.98E+04	2.38E+05	1.00E+04	Yes
LEAD	7439921	mg/kg	23	23	7.56E+03	1.24E+05	8.00E+02	Yes
MANGANESE	7439965	mg/kg	23	23	3.77E+02	5.69E+03	1.90E+03	Yes
MERCURY	7439976	mg/kg	23	22	1.23E+01	1.47E+02	3.10E+01	Yes
NICKEL	7440020	mg/kg	23	23	6.65E+00	2.67E+01	2.00E+03	No
SELENIUM	7782492	mg/kg	23	19	9.35E+00	8.63E+01	5.10E+02	No
SILVER	7440224	mg/kg	23	12	2.48E+01	4.05E+02	5.10E+02	No
THALLIUM	7440280	mg/kg	23	23	3.75E-01	3.09E+00	6.70E+00	No
VANADIUM	7440622	mg/kg	23	22	8.45E+00	2.98E+01	1.00E+02	No
ZINC	7440666	mg/kg	23	23	9.10E+03	1.05E+05	1.00E+04	Yes

**Notes:**

1 - Essential nutrients (such as calcium and sodium) excluded from the evaluation.

2 - USEPA Region IX Preliminary Remediation Goal for Industrial Soil (November 2004).

PRGs are based upon a hazard quotient (HQ) of 0.1 and a cancer risk of  $1 \times 10^{-6}$ .

DuPont site-specific screening level derived for chloride and sulfate using the RDA and default industrial soil ingestion intake values (USEPA Region VIII, 1994).

Sulfide screening level is the low end of the total sulfur background concentration range (Shacklette and Boerngen 1984)

3 - Indiana Risk-Based Closure (RISC) Program Commercial/Industrial Default Migration to Groundwater Values. USEPA Region IX Soil Screening Levels (SSLs) were used if no RISC value was available. Values based on a dilution attenuation factor of 20.

Table C-2  
Fenceline  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - RME  
Current/Future Restoration Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Chemical Intake (mg/kg- day)	SF (mg/kg-day) <sup>-1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	5.01E+01	1.22E-07	6.13E-06	4.00E-04	1.53E-02	8.74E-09	4.38E-07	-	
Arsenic	3.49E+01	1.22E-07	4.27E-06	3.00E-04	1.42E-02	8.74E-09	3.05E-07	1.50E+00	4.57E-07
Cadmium	2.00E+02	1.22E-07	2.44E-05	5.00E-04	4.88E-02	8.74E-09	1.74E-06	-	
Copper	4.14E+02	1.22E-07	5.06E-05	4.00E-02	1.27E-03	8.74E-09	3.62E-06	-	
Iron	1.94E+04	1.22E-07	2.37E-03	3.00E-01	7.91E-03	8.74E-09	1.69E-04	-	
Manganese	3.76E+02	1.22E-07	4.60E-05	2.40E-02	1.92E-03	8.74E-09	3.28E-06	-	
Mercury	2.96E+01	1.22E-07	3.62E-06	3.00E-04	1.21E-02	8.74E-09	2.59E-07	-	
Zinc	9.49E+03	1.22E-07	1.16E-03	3.00E-01	3.87E-03	8.74E-09	8.29E-05	-	
Hazard Index =					1.05E-01	Cancer Risk = 4.57E-07			

Table C-3  
Fenceline  
DuPont East Chicago Facility  
SURFACE SOIL INGESTION - CT  
Current/Future Restoration Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	Chemical			Intake Factor (kg/kg-day)	Intake (mg/kg- day)	SF (mg/kg-day) <sup>-1</sup>	Cancer Risk
			Intake (mg/kg- day)	RfD (mg/kg- day)	HQ				
Antimony	5.01E+01	5.38E-08	2.70E-06	4.00E-04	6.74E-03	3.84E-09	1.93E-07	-	
Arsenic	3.49E+01	5.38E-08	1.88E-06	3.00E-04	6.26E-03	3.84E-09	1.34E-07	1.50E+00	2.01E-07
Cadmium	2.00E+02	5.38E-08	1.07E-05	5.00E-04	2.15E-02	3.84E-09	7.67E-07	-	
Copper	4.14E+02	5.38E-08	2.23E-05	4.00E-02	5.57E-04	3.84E-09	1.59E-06	-	
Iron	1.94E+04	5.38E-08	1.04E-03	3.00E-01	3.48E-03	3.84E-09	7.46E-05	-	
Manganese	3.76E+02	5.38E-08	2.02E-05	2.40E-02	8.43E-04	3.84E-09	1.45E-06	-	
Mercury	2.96E+01	5.38E-08	1.59E-06	3.00E-04	5.31E-03	3.84E-09	1.14E-07	-	
Zinc	9.49E+03	5.38E-08	5.11E-04	3.00E-01	1.70E-03	3.84E-09	3.65E-05	-	
Hazard Index =					4.64E-02	Cancer Risk = 2.01E-07			

Table C-4  
Fenceline  
DuPont East Chicago Facility  
SURFACE SOIL DERMAL CONTACT - RME  
Current/Future Restoration Worker

Chemical Intake = Conc. x Intake Factor x AB

HQ = Chemical Intake / RfD

CR = Chemical Intake x SF

Where:

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk	
Antimony	5.01E+01	8.07E-07	0.010	4.04E-07	4.00E-04	1.01E-03	5.77E-08	0.010	2.89E-08	-		
Arsenic	3.49E+01	8.07E-07	0.030	8.45E-07	3.00E-04	2.82E-03	5.77E-08	0.030	6.04E-08	1.50E+00	9.06E-08	
Cadmium	2.00E+02	8.07E-07	0.001	1.61E-07	1.25E-05	1.29E-02	5.77E-08	0.001	1.15E-08	-		
Copper	4.14E+02	8.07E-07	0.010	3.34E-06	4.00E-02	8.35E-05	5.77E-08	0.010	2.39E-07	-		
Iron	1.94E+04	8.07E-07	0.010	1.57E-04	3.00E-01	5.22E-04	5.77E-08	0.010	1.12E-05	-		
Manganese	3.76E+02	8.07E-07	0.010	3.04E-06	2.40E-02	1.26E-04	5.77E-08	0.010	2.17E-07	-		
Mercury	2.96E+01	8.07E-07	0.010	2.39E-07	3.00E-04	7.96E-04	5.77E-08	0.010	1.71E-08	-		
Zinc	9.49E+03	8.07E-07	0.010	7.66E-05	3.00E-01	2.55E-04	5.77E-08	0.010	5.47E-06	-		
Hazard Index =						1.85E-02	Cancer Risk =					9.06E-08

**Table C-5**  
**Fenceline**  
**DuPont East Chicago Facility**  
**SURFACE SOIL DERMAL CONTACT - CT**  
**Current/Future Restoration Worker**

**Chemical Intake = Conc. x Intake Factor x AB**

**HQ = Chemical Intake / RfD**

**CR = Chemical Intake x SF**

**Where:**

AB = Absorption factor (unitless)

RfD = Reference Dose (mg/kg-day)

SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)

HQ = Hazard Quotient for noncancer effects

CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg- day)	RfD (mg/kg- day)	HQ	Intake Factor (kg/kg-day)	AB	Chemical Intake (mg/kg-day)	SFD (mg/kg- day) <sup>-1</sup>	Cancer Risk	
Antimony	5.01E+01	7.10E-07	0.010	3.56E-07	4.00E-04	8.90E-04	5.07E-08	0.010	2.54E-08	-		
Arsenic	3.49E+01	7.10E-07	0.030	7.44E-07	3.00E-04	2.48E-03	5.07E-08	0.030	5.31E-08	1.50E+00	7.97E-08	
Cadmium	2.00E+02	7.10E-07	0.001	1.42E-07	1.25E-05	1.13E-02	5.07E-08	0.001	1.01E-08	-		
Copper	4.14E+02	7.10E-07	0.010	2.94E-06	4.00E-02	7.35E-05	5.07E-08	0.010	2.10E-07	-		
Iron	1.94E+04	7.10E-07	0.010	1.38E-04	3.00E-01	4.59E-04	5.07E-08	0.010	9.84E-06	-		
Manganese	3.76E+02	7.10E-07	0.010	2.67E-06	2.40E-02	1.11E-04	5.07E-08	0.010	1.91E-07	-		
Mercury	2.96E+01	7.10E-07	0.010	2.10E-07	3.00E-04	7.01E-04	5.07E-08	0.010	1.50E-08	-		
Zinc	9.49E+03	7.10E-07	0.010	6.74E-05	3.00E-01	2.25E-04	5.07E-08	0.010	4.81E-06	-		
Hazard Index =						1.63E-02	Cancer Risk =					7.97E-08

**Table C-6**  
**Fenceline**  
**DuPont East Chicago Facility**  
**INHALATION OF AIR PARTICULATES - RME**  
**Current/Future Restoration Worker**

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m <sup>3</sup> /kg-day)	PEF or VF (m <sup>3</sup> /kg)	Chemical			HQ	Intake Factor (m <sup>3</sup> /kg-day)	Chemical Intake (mg/kg-day)	SFI (mg/kg-day) <sup>-1</sup>	Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)						
Antimony	5.01E+01	2.45E-02	1.32E+09	9.28E-10	-		shc	1.75E-03	6.63E-11	-	
Arsenic	3.49E+01	2.45E-02	1.32E+09	6.47E-10	-		shc	1.75E-03	4.62E-11	1.50E+01	6.93E-10
Cadmium	2.00E+02	2.45E-02	1.32E+09	3.70E-09	-		shc	1.75E-03	2.64E-10	6.30E+00	1.66E-09
Copper	4.14E+02	2.45E-02	1.32E+09	7.67E-09	-		shc	1.75E-03	5.48E-10	-	
Iron	1.94E+04	2.45E-02	1.32E+09	3.60E-07	-		shc	1.75E-03	2.57E-08	-	
Manganese	3.76E+02	2.45E-02	1.32E+09	6.97E-09	1.40E-05	4.98E-04	shc	1.75E-03	4.98E-10	-	
Mercury	2.96E+01	2.45E-02	1.32E+09	5.49E-10	8.60E-05	6.38E-06	shc	1.75E-03	3.92E-11	-	
Zinc	9.49E+03	2.45E-02	1.32E+09	1.76E-07	-		shc	1.75E-03	1.26E-08	-	
Hazard Index =					5.04E-04		Cancer Risk = 2.36E-09				

Table C-7  
Fenceline  
DuPont East Chicago Facility  
INHALATION OF AIR PARTICULATES - CT  
Current/Future Restoration Worker

HQ = Chemical Intake / RfD  
CR = Chemical Intake x SF

**Where:**

PEF = Particulate emission factor (m<sup>3</sup>/kg)  
VF = Volatilization factor (m<sup>3</sup>/kg), chemical specific  
RfD = Reference Dose (mg/kg-day)  
SF = Cancer Slope Factor ((mg/kg-day)<sup>-1</sup>)  
HQ = Hazard Quotient for noncancer effects  
CR = Cancer risk

Chemical of Concern	Soil Conc. (mg/kg)	Intake Factor (m³/kg-day)	PEF or VF (m³/kg)	Chemical			Intake Factor (m³/kg-day)	Chemical		Cancer Risk
				Intake (mg/kg-day)	RfDi (mg/kg-day)	HQ		Intake (mg/kg-day)	SFI (mg/kg-day)⁻¹	
Antimony	5.01E+01	2.15E-02	1.32E+09	8.17E-10	-		1.54E-03	5.84E-11	-	
Arsenic	3.49E+01	2.15E-02	1.32E+09	5.69E-10	-		1.54E-03	4.07E-11	1.50E+01	6.10E-10
Cadmium	2.00E+02	2.15E-02	1.32E+09	3.26E-09	-		1.54E-03	2.33E-10	6.30E+00	1.46E-09
Copper	4.14E+02	2.15E-02	1.32E+09	6.75E-09	-		1.54E-03	4.82E-10	-	
Iron	1.94E+04	2.15E-02	1.32E+09	3.16E-07	-		1.54E-03	2.26E-08	-	
Manganese	3.76E+02	2.15E-02	1.32E+09	6.13E-09	1.40E-05	4.38E-04	1.54E-03	4.38E-10	-	
Mercury	2.96E+01	2.15E-02	1.32E+09	4.83E-10	8.60E-05	5.61E-06	1.54E-03	3.45E-11	-	
Zinc	9.49E+03	2.15E-02	1.32E+09	1.55E-07	-		1.54E-03	1.11E-08	-	
Hazard Index =						4.44E-04	Cancer Risk = 2.07E-09			

Table C-8  
Summary of Health Risks, Fenceline  
DuPont East Chicago Facility  
East Chicago, Indiana

Receptor/Pathway	RME		CT	
	HI	CR	HI	CR
Current/Future Restoration Worker				
Surface Soil Ingestion	1.E-01	5.E-07	5.E-02	2.E-07
Surface Soil Dermal Contact	2.E-02	9.E-08	2.E-02	8.E-08
Inhalation of Air Particulates - Surface Soil	5.E-04	2.E-09	4.E-04	2.E-09
<b>Total</b>	<b>1.E-01</b>	<b>6.E-07</b>	<b>6.E-02</b>	<b>3.E-07</b>

**APPENDIX D**  
**EXPOSURE POINT CONCENTRATIONS FOR RISK**  
**ASSESSMENT UPDATE**

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Arsenic

### AOC 6, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is less than 100% - Use the MVUE of the log-normal mean and H-statistic derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	307	
2	92.5	
3	275	
4	109	
5	62.3	
6	118	
7	91.9	

<b>Low-End EPC</b>		MVUE of the log-mean	148.9322937
<b>High-End EPC</b>		UCL based on H-statistic	291.8619657
<b>Raw Data Results</b>			
Number of Samples		7	
Percent Detection	100%	7 of 7	Percent Detects J-coded 0%
Maximum Detection	3.07E+02	Minimum Detection	6.23E+01
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	1.51E+02	Mean Standard Error	3.70E+01
Standard Deviation	9.78E+01	Coefficient of Variance (%)	65%
Dataset Skewness	Pass 6.91E-01	Dataset Kurtosis	Fail 1.44E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.03E-01	Calculated Value for dataset	7.81E-01
90% UCL using t-statistic	2.04E+02	95% UCL using -t-statistic	2.23E+02
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	1.49E+02	Standard error of the log-mean	3.36E+01
Standard Deviation	5.94E-01	Coefficient of Variance (%)	12%
Dataset Skewness	Pass 4.42E-01	Dataset Kurtosis	Fail 1.39E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	8.75E-01
Anderson Darling (AD) A <sup>2</sup>	4.90E-01	AD Probability	Pass 7.57E-01
90% UCL of the MVUE	2.38E+02	95% UCL of the MVUE	2.92E+02
EPA Concentration Term	2.92E+02	Chebychev 95% UCL	2.99E+02
<b>Jackknife Results</b>			
Jackknifed Mean	1.51E+02	Jackknifed Standard Error	3.70E+01
90% UCL of the mean	2.04E+02	95% UCL of the mean	2.23E+02
90% UCL of the MVUE <sup>2</sup>	2.02E+02	95% UCL of the MVUE <sup>2</sup>	2.22E+02
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean	1.51E+02	90% UCL 1.96E+02 95% UCL 2.08E+02
Skewness	3.32E-01	Kurtosis	2.70E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivitol (t) Bootstrap	90% UCL	3.73E+02	95% UCL 4.74E+02
Skewness	-2.70E+00	Kurtosis	1.06E+01
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL	2.07E+02	95% UCL 4.27E+02
Skewness	-9.45E+00	Kurtosis	1.25E+02
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Antimony AOC 6, Surface Soil

The data are best described as normally distributed and there were a sufficient number of detected values to perform a statistical analysis. Use the normal mean and t-statistic derived UCLs as EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	18.9	J
2	48.3	J
3	5.36	J
4	19.2	J
5	31.7	J
6	16.7	J
7	5.83	J

<b>Low-End EPC</b>		Normal Mean	20.85571429
<b>High-End EPC</b>		UCL based on t-statistic	31.91532293
<b>Raw Data Results</b>			
Number of Samples		7	
Percent Detection	100%	7 of 7	Percent Detects J-coded 100%
Maximum Detection	4.83E+01	Minimum Detection	5.36E+00
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	2.09E+01	Mean Standard Error	5.69E+00
Standard Deviation	1.51E+01	Coefficient of Variance (%)	72%
Dataset Skewness	Pass 6.17E-01	Dataset Kurtosis	Pass 1.92E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	8.98E-01
90% UCL using t-statistic	2.91E+01	95% UCL using -t-statistic	3.19E+01
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	2.13E+01	Standard error of the log-mean	6.58E+00
Standard Deviation	8.13E-01	Coefficient of Variance (%)	29%
Dataset Skewness	Pass -2.10E-01	Dataset Kurtosis	Fail 1.38E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	9.13E-01
Anderson Darling (AD) A <sup>2</sup>	3.51E-01	AD Probability	Pass 8.97E-01
90% UCL of the MVUE	4.58E+01	95% UCL of the MVUE	6.49E+01
EPA Concentration Term	6.49E+01	Chebychev 95% UCL	5.07E+01
<b>Jackknife Results</b>			
Jackknifed Mean	2.09E+01	Jackknifed Standard Error	5.69E+00
90% UCL of the mean	2.91E+01	95% UCL of the mean	3.19E+01
90% UCL of the MVUE <sup>2</sup>	3.01E+01	95% UCL of the MVUE <sup>2</sup>	3.31E+01
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean 2.09E+01	90% UCL 2.76E+01	95% UCL 2.95E+01
Skewness	4.42E-01	Kurtosis	3.05E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivitol (t) Bootstrap	90% UCL 3.38E+01	95% UCL	3.92E+01
Skewness	-8.55E-01	Kurtosis	4.82E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Hall's t Bootstrap	90% UCL 3.74E+01	95% UCL	3.96E+01
Skewness	-1.79E+00	Kurtosis	1.31E+01
Quantile fit is good - Bootstrap Output is Normal or nearly so			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Zinc AOC 12, Surface Soil

There is a sufficient number of values for statistical analysis - the data were found to be non-normally distributed and the number of samples is below 15 - use the Jackknife mean and UCL as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	2830	
2	1410	
3	1530	
4	30100	
5	1490	
6	1840	
7	1380	
8	10000	
9	105000	

<b>Low-End EPC</b>		Jackknife Mean	17286.66667
<b>High-End EPC</b>		Jackknifed UCL	38490.36012
<b>Raw Data Results</b>			
Number of Samples		9	
Percent Detection	100%	9 of 9	Percent Detects J-coded 0%
Maximum Detection	1.05E+05		Minimum Detection 1.38E+03
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	1.73E+04	Mean Standard Error	1.14E+04
Standard Deviation	3.42E+04	Coefficient of Variance (%)	198%
Dataset Skewness	Fail 1.82E+00	Dataset Kurtosis	Pass 4.83E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	5.56E-01
90% UCL using t-statistic	3.32E+04	95% UCL using -t-statistic	3.85E+04
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	1.25E+04	Standard error of the log-mean	6.83E+03
Standard Deviation	1.59E+00	Coefficient of Variance (%)	19%
Dataset Skewness	Pass 8.85E-01	Dataset Kurtosis	Pass 2.06E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	7.79E-01
Anderson Darling (AD) A <sup>2</sup>	8.98E-01	AD Probability	Fail 4.14E-01
90% UCL of the MVUE	9.38E+04	95% UCL of the MVUE	2.15E+05
EPA Concentration Term	2.15E+05	Chebychev 95% UCL	4.30E+04
<b>Jackknife Results</b>			
Jackknifed Mean	1.73E+04	Jackknifed Standard Error	1.14E+04
90% UCL of the mean	3.32E+04	95% UCL of the mean	3.85E+04
90% UCL of the MVUE <sup>2</sup>	2.33E+04	95% UCL of the MVUE <sup>2</sup>	2.76E+04
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean 1.71E+04	90% UCL 3.07E+04	95% UCL 3.46E+04
Skewness	6.52E-01	Kurtosis 3.07E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivitol (t) Bootstrap	90% UCL 1.51E+05	95% UCL 2.07E+05	
Skewness	-1.30E+01	Kurtosis 2.25E+02	
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL 1.54E+05	95% UCL 2.07E+05	
Skewness	-1.85E+01	Kurtosis 3.62E+02	
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Mercury

### AOC 12, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	16	
2	0.569	
3	1.21	
4	23.6	
5	0.751	
6	0.806	
7	147	
8	20.8	
9	0.763	

<b>Low-End EPC</b>	MVUE of the log-mean	21.32657019
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	51.78434218

Raw Data Results			
Number of Samples	9		
Percent Detection	100%	9 of 9	Percent Detects J-coded 0%
Maximum Detection	1.47E+02		Minimum Detection 5.69E-01
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	2.35E+01	Mean Standard Error	1.58E+01
Standard Deviation	4.73E+01	Coefficient of Variance (%)	201%
Dataset Skewness	Fail 1.92E+00	Dataset Kurtosis	Pass 5.20E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	5.48E-01
90% UCL using t-statistic	4.55E+01	95% UCL using -t-statistic	5.28E+01

Natural Log-Transformed Results			
MVUE of the log-mean	2.13E+01	Standard error of the log-mean	1.45E+01
Standard Deviation	2.06E+00	Coefficient of Variance (%)	145%
Dataset Skewness	Pass 4.20E-01	Dataset Kurtosis	Fail 1.36E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.29E-01	Calculated Value for dataset	8.31E-01
Anderson Darling (AD) A <sup>2</sup>	7.36E-01	AD Probability	Pass 5.28E-01
90% UCL of the MVUE	6.22E+02	95% UCL of the MVUE	2.43E+03
EPA Concentration Term	2.43E+03	Chebychev 95% UCL	8.62E+01

Jackknife Results			
Jackknifed Mean	2.35E+01	Jackknifed Standard Error	1.58E+01
90% UCL of the mean	4.55E+01	95% UCL of the mean	5.28E+01
90% UCL of the MVUE <sup>2</sup>	4.37E+01	95% UCL of the MVUE <sup>2</sup>	5.18E+01

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	2.30E+01	90% UCL	4.20E+01	95% UCL 4.74E+01
	Skewness	7.35E-01	Kurtosis	3.06E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap	90% UCL	1.16E+02	95% UCL		1.43E+02
	Skewness	-1.37E+01	Kurtosis	1.94E+02	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	1.24E+02	95% UCL		1.43E+02
	Skewness	-1.77E+01	Kurtosis	3.39E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Manganese AOC 12, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	96.1	
2	76.8	
3	5690	
4	68.6	
5	101	
6	1450	
7	100	
8	314	
9	428	

<b>Low-End EPC</b>	MVUE of the log-mean	679.5991976
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	1464.005002

Raw Data Results			
Number of Samples	9		
Percent Detection	100%	9 of 9	Percent Detects J-coded 0%
Maximum Detection	5.69E+03		Minimum Detection 6.86E+01
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	9.25E+02	Mean Standard Error	6.14E+02
Standard Deviation	1.84E+03	Coefficient of Variance (%)	199%
Dataset Skewness	Fail 1.87E+00	Dataset Kurtosis	Pass 5.02E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	5.44E-01
90% UCL using t-statistic	1.78E+03	95% UCL using -t-statistic	2.07E+03

Natural Log-Transformed Results			
MVUE of the log-mean	6.80E+02	Standard error of the log-mean	3.58E+02
Standard Deviation	1.53E+00	Coefficient of Variance (%)	28%
Dataset Skewness	Pass 8.45E-01	Dataset Kurtosis	Pass 2.15E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.29E-01	Calculated Value for dataset	8.32E-01
Anderson Darling (AD) A <sup>2</sup>	6.73E-01	AD Probability	Pass 5.80E-01
90% UCL of the MVUE	4.42E+03	95% UCL of the MVUE	9.55E+03
EPA Concentration Term	9.55E+03	Chebychev 95% UCL	2.28E+03

Jackknife Results			
Jackknifed Mean	9.25E+02	Jackknifed Standard Error	6.14E+02
90% UCL of the mean	1.78E+03	95% UCL of the mean	2.07E+03
90% UCL of the MVUE <sup>2</sup>	1.24E+03	95% UCL of the MVUE <sup>2</sup>	1.46E+03

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	9.16E+02	90% UCL	1.63E+03	95% UCL 1.83E+03
	Skewness	7.84E-01	Kurtosis	3.70E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	9.11E+03	95% UCL		1.27E+04
	Skewness	-1.54E+01	Kurtosis	3.04E+02	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	9.96E+03	95% UCL		1.27E+04
	Skewness	-3.15E+01	Kurtosis	9.97E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Iron

### AOC 12, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	6800	
2	5070	
3	9700	
4	60800	
5	238000	
6	6350	
7	10300	
8	24100	
9	12500	

<b>Low-End EPC</b>	MVUE of the log-mean	32081.51528
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	63727.85293

#### Raw Data Results

Number of Samples	9		
Percent Detection	100%	9 of 9	Percent Detects J-coded 0%
Maximum Detection	2.38E+05		Minimum Detection 5.07E+03
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

#### Normal (Non-transformed) Results

Normal Mean	4.15E+04	Mean Standard Error	2.52E+04
Standard Deviation	7.57E+04	Coefficient of Variance (%)	182%
Dataset Skewness	Fail 1.88E+00	Dataset Kurtosis	Pass 5.06E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	5.48E-01
90% UCL using t-statistic	7.68E+04	95% UCL using -t-statistic	8.85E+04

#### Natural Log-Transformed Results

MVUE of the log-mean	3.21E+04	Standard error of the log-mean	1.40E+04
Standard Deviation	1.26E+00	Coefficient of Variance (%)	13%
Dataset Skewness	Pass 9.84E-01	Dataset Kurtosis	Pass 2.53E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.29E-01	Calculated Value for dataset	8.48E-01
Anderson Darling (AD) A <sup>2</sup>	6.08E-01	AD Probability	Pass 6.40E-01
90% UCL of the MVUE	1.16E+05	95% UCL of the MVUE	1.98E+05
EPA Concentration Term	1.98E+05	Chebychev 95% UCL	9.45E+04

#### Jackknife Results

Jackknifed Mean	4.15E+04	Jackknifed Standard Error	2.52E+04
90% UCL of the mean	7.68E+04	95% UCL of the mean	8.85E+04
90% UCL of the MVUE <sup>2</sup>	5.49E+04	95% UCL of the MVUE <sup>2</sup>	6.37E+04

#### Bootstrap Results (Raw Data)

Standard Bootstrap	Mean	4.09E+04	90% UCL	7.07E+04	95% UCL	7.91E+04
	Skewness	7.17E-01	Kurtosis	3.13E+00		
Quantile fit is good - Bootstrap Output is Normal or nearly so						
Pivotal (t) Bootstrap	90% UCL	3.08E+05	95% UCL	4.73E+05		
	Skewness	-4.20E+00	Kurtosis	2.40E+01		
Quantile fit is poor do not use Bootstrap Results						
Hall's t Bootstrap	90% UCL	1.69E+05	95% UCL	1.42E+06		
	Skewness	-1.05E+01	Kurtosis	1.68E+02		
Quantile fit is poor do not use Bootstrap Results						

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Copper AOC 12, Surface Soil

There is a sufficient number of values for statistical analysis - the data were found to be non-normally distributed and the number of samples is below 15 - use the Jackknife mean and UCL as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	53.7	
2	4470	
3	58.3	
4	69.8	
5	51.6	
6	76.1	
7	2140	
8	32.2	
9	469	

<b>Low-End EPC</b>		Jackknife Mean	824.5222222
<b>High-End EPC</b>		Jackknifed UCL	1771.761091
<b>Raw Data Results</b>			
Number of Samples		9	
Percent Detection	100%	9 of 9	Percent Detects J-coded 0%
Maximum Detection	4.47E+03		Minimum Detection 3.22E+01
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	8.25E+02	Mean Standard Error	5.09E+02
Standard Deviation	1.53E+03	Coefficient of Variance (%)	185%
Dataset Skewness	Fail 1.49E+00	Dataset Kurtosis	Pass 3.70E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	6.09E-01
90% UCL using t-statistic	1.54E+03	95% UCL using -t-statistic	1.77E+03
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	6.23E+02	Standard error of the log-mean	3.81E+02
Standard Deviation	1.81E+00	Coefficient of Variance (%)	35%
Dataset Skewness	Pass 7.78E-01	Dataset Kurtosis	Pass 1.75E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	7.95E-01
Anderson Darling (AD) A <sup>2</sup>	9.00E-01	AD Probability	Fail 4.14E-01
90% UCL of the MVUE	8.32E+03	95% UCL of the MVUE	2.40E+04
EPA Concentration Term	2.40E+04	Chebychev 95% UCL	2.33E+03
<b>Jackknife Results</b>			
Jackknifed Mean	8.25E+02	Jackknifed Standard Error	5.09E+02
90% UCL of the mean	1.54E+03	95% UCL of the mean	1.77E+03
90% UCL of the MVUE <sup>2</sup>	1.23E+03	95% UCL of the MVUE <sup>2</sup>	1.47E+03
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean 8.13E+02	90% UCL 1.44E+03	95% UCL 1.62E+03
Skewness	6.96E-01	Kurtosis	3.55E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivitol (t) Bootstrap	90% UCL 6.75E+03	95% UCL	9.27E+03
Skewness	-5.81E+00	Kurtosis	3.74E+01
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL	Method Fails	95% UCL
Skewness	-2.01E+01	Kurtosis	4.97E+02
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Cadmium

### AOC 12, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	14.4	J
2	32.7	J
3	23.4	J
4	47.6	
5	7.5	J
6	16.1	J
7	1560	
8	3660	
9	322	

<b>Low-End EPC</b>	MVUE of the log-mean	497.5898542
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	1276.669118

#### Raw Data Results

Number of Samples	9		
Percent Detection	100%	9 of 9	Percent Detects J-coded 56%
Maximum Detection	3.66E+03		Minimum Detection 7.50E+00
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

#### Normal (Non-transformed) Results

Normal Mean	6.32E+02	Mean Standard Error	4.14E+02
Standard Deviation	1.24E+03	Coefficient of Variance (%)	197%
Dataset Skewness	Fail 1.58E+00	Dataset Kurtosis	Pass 4.00E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	5.97E-01
90% UCL using t-statistic	1.21E+03	95% UCL using -t-statistic	1.40E+03

#### Natural Log-Transformed Results

MVUE of the log-mean	4.98E+02	Standard error of the log-mean	3.56E+02
Standard Deviation	2.21E+00	Coefficient of Variance (%)	51%
Dataset Skewness	Pass 6.33E-01	Dataset Kurtosis	Fail 1.62E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.29E-01	Calculated Value for dataset	8.68E-01
Anderson Darling (AD) A <sup>2</sup>	5.66E-01	AD Probability	Pass 6.80E-01
90% UCL of the MVUE	2.39E+04	95% UCL of the MVUE	1.14E+05
EPA Concentration Term	1.14E+05	Chebychev 95% UCL	2.09E+03

#### Jackknife Results

Jackknifed Mean	6.32E+02	Jackknifed Standard Error	4.14E+02
90% UCL of the mean	1.21E+03	95% UCL of the mean	1.40E+03
90% UCL of the MVUE <sup>2</sup>	1.05E+03	95% UCL of the MVUE <sup>2</sup>	1.28E+03

#### Bootstrap Results (Raw Data)

Standard Bootstrap	Mean	6.28E+02	90% UCL	1.13E+03	95% UCL	1.27E+03
	Skewness	6.03E-01	Kurtosis	2.91E+00		
Quantile fit is good - Bootstrap Output is Normal or nearly so						
Pivotal (t) Bootstrap	90% UCL	4.59E+03	95% UCL	8.19E+03		
	Skewness	-9.03E+00	Kurtosis	1.14E+02		
Quantile fit is poor do not use Bootstrap Results						
Hall's t Bootstrap	90% UCL	4.59E+03	95% UCL	8.21E+03		
	Skewness	-1.87E+01	Kurtosis	3.77E+02		
Quantile fit is poor do not use Bootstrap Results						

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Arsenic

### AOC 12, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	34.7	
2	433	J
3	26.1	
4	163	
5	38.4	
6	33.9	
7	117	
8	33.5	
9	13.3	

<b>Low-End EPC</b>	MVUE of the log-mean	89.87000697
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	163.1647833

Raw Data Results			
Number of Samples	9		
Percent Detection	100%	9 of 9	Percent Detects J-coded 11%
Maximum Detection	4.33E+02		Minimum Detection 1.33E+01
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	9.92E+01	Mean Standard Error	4.49E+01
Standard Deviation	1.35E+02	Coefficient of Variance (%)	136%
Dataset Skewness	Fail 1.61E+00	Dataset Kurtosis	Pass 4.26E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.29E-01	Calculated Value for dataset	6.56E-01
90% UCL using t-statistic	1.62E+02	95% UCL using -t-statistic	1.83E+02

Natural Log-Transformed Results			
MVUE of the log-mean	8.99E+01	Standard error of the log-mean	3.37E+01
Standard Deviation	1.08E+00	Coefficient of Variance (%)	27%
Dataset Skewness	Pass 6.13E-01	Dataset Kurtosis	Pass 1.98E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.29E-01	Calculated Value for dataset	8.97E-01
Anderson Darling (AD) A <sup>2</sup>	5.44E-01	AD Probability	Pass 7.02E-01
90% UCL of the MVUE	2.41E+02	95% UCL of the MVUE	3.61E+02
EPA Concentration Term	3.61E+02	Chebychev 95% UCL	2.40E+02

Jackknife Results			
Jackknifed Mean	9.92E+01	Jackknifed Standard Error	4.49E+01
90% UCL of the mean	1.62E+02	95% UCL of the mean	1.83E+02
90% UCL of the MVUE <sup>2</sup>	1.44E+02	95% UCL of the MVUE <sup>2</sup>	1.63E+02

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	9.72E+01	90% UCL	1.50E+02	95% UCL 1.65E+02
	Skewness	6.67E-01	Kurtosis	3.30E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	2.74E+02	95% UCL	3.82E+02	
	Skewness	-6.77E+00	Kurtosis	5.91E+01	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	2.87E+02	95% UCL	3.81E+02	
	Skewness	-1.86E+01	Kurtosis	3.93E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Antimony AOC 12, Surface Soil

The data are best described as normally distributed and there were a sufficient number of detected values to perform a statistical analysis. Use the normal mean and t-statistic derived UCLs as EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	8.45	J
2	220	
3	24.5	J
4	400	
5	50.2	J
6	3.87	J
7	273	
8	248	J
9	9.43	J

<b>Low-End EPC</b>	Normal Mean	137.4944444
<b>High-End EPC</b>	UCL based on t-statistic	229.8463009

Raw Data Results			
Number of Samples	9		
Percent Detection	100%	9 of 9	Percent Detects J-coded 67%
Maximum Detection	4.00E+02		Minimum Detection 3.87E+00
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	1.37E+02	Mean Standard Error	4.97E+01
Standard Deviation	1.49E+02	Coefficient of Variance (%)	108%
Dataset Skewness	Pass 4.62E-01	Dataset Kurtosis	Fail 1.44E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Pass
Critical Value	8.29E-01	Calculated Value for dataset	8.33E-01
90% UCL using t-statistic	2.07E+02	95% UCL using -t-statistic	2.30E+02

Natural Log-Transformed Results			
MVUE of the log-mean	1.75E+02	Standard error of the log-mean	1.05E+02
Standard Deviation	1.77E+00	Coefficient of Variance (%)	45%
Dataset Skewness	Pass -1.48E-01	Dataset Kurtosis	Fail 1.14E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.29E-01	Calculated Value for dataset	8.90E-01
Anderson Darling (AD) A <sup>2</sup>	4.52E-01	AD Probability	Pass 7.96E-01
90% UCL of the MVUE	2.06E+03	95% UCL of the MVUE	5.66E+03
EPA Concentration Term	5.66E+03	Chebychev 95% UCL	6.44E+02

Jackknife Results			
Jackknifed Mean	1.37E+02	Jackknifed Standard Error	4.97E+01
90% UCL of the mean	2.07E+02	95% UCL of the mean	2.30E+02
90% UCL of the MVUE <sup>2</sup>	3.25E+02	95% UCL of the MVUE <sup>2</sup>	3.70E+02

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	1.40E+02	90% UCL	2.03E+02	95% UCL 2.21E+02
	Skewness	1.85E-01	Kurtosis	2.75E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap	90% UCL	2.29E+02	95% UCL	2.51E+02	
	Skewness	-9.73E+00	Kurtosis	1.32E+02	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	2.34E+02	95% UCL	2.52E+02	
	Skewness	-2.18E+01	Kurtosis	4.93E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Lead

### Fenceline, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	7.23	J
2	2270	J
3	5.49	J
4	154	J
5	59.6	
6	364	
7	195	J
8	850	J
9	943	
10	5720	J
11	3.53	
12	236	J
13	1270	
14	91.9	J
15	1160	J
16	291	J
17	1100	J
18	77	J
19	7.68	J
20	2.07	J
21	124000	J
22	33200	J
23	45.7	J
24	2900	J

Low-End EPC		MVUE of the log-mean		7367.360254	
High-End EPC		UCL based on Jackknifed MVUE		17778.12111	
Raw Data Results					
Number of Samples		24			
Percent Detection		100%	24 of 24	Percent Detects J-coded 79%	
Maximum Detection		1.24E+05		Minimum Detection 2.07E+00	
Maximum Non-detection <sup>1</sup>		All Detects		Minimum Non-detection <sup>1</sup> All Detects	
Normal (Non-transformed) Results					
Normal Mean		7.29E+03		Mean Standard Error 5.26E+03	
Standard Deviation		2.58E+04		Coefficient of Variance (%) 353%	
Dataset Skewness		Fail	3.90E+00	Dataset Kurtosis Fail 1.76E+01	
Tested for Normality		W-Test		NormalityResult (a = 0.05) Fail	
Critical Value		9.16E-01		Calculated Value for dataset 3.12E-01	
90% UCL using t-statistic		1.42E+04		95% UCL using -t-statistic 1.63E+04	
Natural Log-Transformed Results					
MVUE of the log-mean		7.37E+03		Standard error of the log-mean 5.40E+03	
Standard Deviation		2.81E+00		Coefficient of Variance (%) 51%	
Dataset Skewness		Pass	1.37E-01	Dataset Kurtosis Pass 2.41E+00	
Tested for Normality		W-Test		Normality Result (a = 0.05) Pass	
Critical Value		9.16E-01		Calculated Value for dataset 9.73E-01	
Anderson Darling (AD) A <sup>2</sup>		2.40E-01		AD Probability Pass 9.75E-01	
90% UCL of the MVUE		1.32E+05		95% UCL of the MVUE 3.09E+05	
EPA Concentration Term		3.09E+05		Chebychev 95% UCL 3.15E+04	
Jackknife Results					
Jackknifed Mean		7.29E+03		Jackknifed Standard Error 5.26E+03	
90% UCL of the mean		1.42E+04		95% UCL of the mean 1.63E+04	
90% UCL of the MVUE <sup>2</sup>		1.54E+04		95% UCL of the MVUE <sup>2</sup> 1.78E+04	
Bootstrap Results (Raw Data)					
Standard Bootstrap		Mean	7.57E+03	90% UCL	1.44E+04 95% UCL 1.63E+04
Skewness		1.04E+00		Kurtosis 4.16E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap		90% UCL	2.88E+04		95% UCL 1.43E+05
Skewness		-4.28E+00		Kurtosis 2.61E+01	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap		90% UCL	2.88E+04		95% UCL 1.99E+05
Skewness		-1.27E+01		Kurtosis 1.96E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Zinc

### Fenceline, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	265	
2	75.3	
3	589	
4	105000	
5	200	
6	620	
7	30100	
8	10000	
9	242	
10	949	
11	14200	
12	327	
13	150	
14	84.2	
15	8650	
16	1490	
17	10400	
18	14800	
19	2040	
20	10400	
21	5260	
22	565	
23	1210	
24	383	

<b>Low-End EPC</b>		MVUE of the log-mean	9487.565317
<b>High-End EPC</b>		UCL based on Jackknifed MVUE	18637.57413
<b>Raw Data Results</b>			
Number of Samples		24	
Percent Detection	100%	24 of 24	Percent Detects J-coded 0%
Maximum Detection	1.05E+05	Minimum Detection	7.53E+01
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	9.08E+03	Mean Standard Error	4.42E+03
Standard Deviation	2.17E+04	Coefficient of Variance (%)	239%
Dataset Skewness	Fail 3.61E+00	Dataset Kurtosis	Fail 1.60E+01
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	4.41E-01
90% UCL using t-statistic	1.49E+04	95% UCL using -t-statistic	1.67E+04
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	9.49E+03	Standard error of the log-mean	5.01E+03
Standard Deviation	2.01E+00	Coefficient of Variance (%)	27%
Dataset Skewness	Pass 2.86E-01	Dataset Kurtosis	Fail 1.85E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	9.16E-01	Calculated Value for dataset	9.49E-01
Anderson Darling (AD) A <sup>2</sup>	4.98E-01	AD Probability	Pass 7.49E-01
90% UCL of the MVUE	4.03E+04	95% UCL of the MVUE	6.34E+04
EPA Concentration Term	6.34E+04	Chebychev 95% UCL	3.19E+04
<b>Jackknife Results</b>			
Jackknifed Mean	9.08E+03	Jackknifed Standard Error	4.42E+03
90% UCL of the mean	1.49E+04	95% UCL of the mean	1.67E+04
90% UCL of the MVUE <sup>2</sup>	1.65E+04	95% UCL of the MVUE <sup>2</sup>	1.86E+04
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean	9.13E+03	90% UCL 1.47E+04 95% UCL 1.63E+04
	Skewness	8.10E-01	Kurtosis 3.82E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivitol (t) Bootstrap	90% UCL	2.75E+04	95% UCL 3.35E+04
	Skewness	-1.95E+00	Kurtosis 8.66E+00
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL	2.54E+04	95% UCL 3.58E+04
	Skewness	-1.07E+01	Kurtosis 1.58E+02
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Mercury Fenceline, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	20.8	
2	0.72	
3	0.0086	J
4	48.7	
5	0.00165	U
6	1.03	
7	0.667	
8	0.123	J
9	0.0634	J
10	16	
11	0.0268	J
12	23.6	
13	4.15	
14	0.819	
15	0.0267	J
16	0.3	
17	8.67	
18	147	
19	0.799	
20	1.11	
21	7.24	
22	0.816	
23	3.7	
24	0.0271	J

<b>Low-End EPC</b>		MVUE of the log-mean	29.64752768
<b>High-End EPC</b>		UCL based on Jackknifed MVUE	73.95511493
<b>Raw Data Results</b>			
Number of Samples	24		
Percent Detection	96%	23 of 24	Percent Detects J-coded 26%
Maximum Detection	1.47E+02	Minimum Detection	8.60E-03
Maximum Non-detection <sup>1</sup>	1.65E-03	Minimum Non-detection <sup>1</sup>	1.65E-03
<b>Normal (Non-transformed) Results</b>			
Normal Mean	1.19E+01	Mean Standard Error	6.31E+00
Standard Deviation	3.09E+01	Coefficient of Variance (%)	259%
Dataset Skewness	Fail 3.52E+00	Dataset Kurtosis	Fail 1.53E+01
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	4.31E-01
90% UCL using t-statistic	2.03E+01	95% UCL using -t-statistic	2.27E+01
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	2.96E+01	Standard error of the log-mean	2.24E+01
Standard Deviation	2.91E+00	Coefficient of Variance (%)	-1525%
Dataset Skewness	Pass -2.46E-01	Dataset Kurtosis	Pass 2.18E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	9.16E-01	Calculated Value for dataset	9.74E-01
Anderson Darling (AD) A <sup>2</sup>	2.84E-01	AD Probability	Pass 9.50E-01
90% UCL of the MVUE	6.66E+02	95% UCL of the MVUE	1.66E+03
EPA Concentration Term	1.66E+03	Chebychev 95% UCL	1.30E+02
<b>Jackknife Results</b>			
Jackknifed Mean	1.19E+01	Jackknifed Standard Error	6.31E+00
90% UCL of the mean	2.03E+01	95% UCL of the mean	2.27E+01
90% UCL of the MVUE <sup>2</sup>	6.47E+01	95% UCL of the MVUE <sup>2</sup>	7.40E+01
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean	1.19E+01	90% UCL 1.94E+01 95% UCL 2.16E+01
	Skewness	6.66E-01	Kurtosis 3.31E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivotal (t) Bootstrap	90% UCL	3.64E+01	95% UCL 5.18E+01
	Skewness	-8.30E+00	Kurtosis 1.28E+02
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL	3.34E+01	95% UCL 5.18E+01
	Skewness	-3.09E+01	Kurtosis 9.67E+02
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Manganese Fenceline, Surface Soil

There is a sufficient number of values for statistical analysis - the data were found to be non-normal with high skewness, however, the Hall's transformed t bootstrap failed to normalize the dataset - use the Standard Bootstrap mean and UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	48.6	
2	110	
3	13.8	
4	98.5	
5	15.7	
6	1450	
7	69	
8	18.1	
9	35.3	
10	347	
11	20.9	
12	5690	
13	17.1	
14	16.4	
15	8.51	J
16	428	
17	68.6	
18	10.7	
19	447	
20	14	
21	17.4	
22	29	
23	19.6	
24	20.3	

<b>Low-End EPC</b>		Bootstrap Mean	376.2937779
<b>High-End EPC</b>		Standard Bootstrap UCL	768.018933
<b>Raw Data Results</b>			
Number of Samples	24		
Percent Detection	100%	24 of 24	Percent Detects J-coded 4%
Maximum Detection	5.69E+03	Minimum Detection	8.51E+00
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	3.76E+02	Mean Standard Error	2.39E+02
Standard Deviation	1.17E+03	Coefficient of Variance (%)	312%
Dataset Skewness	Fail 3.89E+00	Dataset Kurtosis	Fail 1.76E+01
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	3.43E-01
90% UCL using t-statistic	6.91E+02	95% UCL using -t-statistic	7.86E+02
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	1.96E+02	Standard error of the log-mean	8.48E+01
Standard Deviation	1.69E+00	Coefficient of Variance (%)	42%
Dataset Skewness	Fail 1.19E+00	Dataset Kurtosis	Pass 3.49E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	8.43E-01
Anderson Darling (AD) A <sup>2</sup>	1.42E+00	AD Probability	Fail 1.97E-01
90% UCL of the MVUE	5.49E+02	95% UCL of the MVUE	7.64E+02
EPA Concentration Term	7.64E+02	Chebychev 95% UCL	5.75E+02
<b>Jackknife Results</b>			
Jackknifed Mean	3.76E+02	Jackknifed Standard Error	2.39E+02
90% UCL of the mean	6.91E+02	95% UCL of the mean	7.86E+02
90% UCL of the MVUE <sup>2</sup>	3.31E+02	95% UCL of the MVUE <sup>2</sup>	3.79E+02
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean	3.76E+02	90% UCL 6.81E+02 95% UCL 7.68E+02
	Skewness	8.21E-01	Kurtosis 3.51E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivitol (t) Bootstrap	90% UCL	2.50E+03	95% UCL 3.44E+03
	Skewness	-4.26E+00	Kurtosis 3.36E+01
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL	2.45E+03	95% UCL 3.72E+03
	Skewness	-9.61E+00	Kurtosis 1.25E+02
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Iron Fenceline, Surface Soil

There is a sufficient number of values for statistical analysis - the data were found to be non-normal with high skewness, however, the Hall's transformed t bootstrap failed to normalize the dataset - use the Standard Bootstrap mean and UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	4840	
2	13900	
3	24100	
4	1280	
5	2770	
6	2240	
7	6200	
8	2680	
9	2820	
10	2610	
11	18500	
12	19100	
13	6350	
14	60800	
15	1700	
16	3390	
17	238000	
18	13500	
19	2530	
20	978	
21	3040	
22	2680	
23	2380	
24	31900	

Low-End EPC		Bootstrap Mean		19399.70317	
High-End EPC		Standard Bootstrap UCL		34625.64394	
Raw Data Results					
Number of Samples		24			
Percent Detection		100%	24 of 24	Percent Detects J-coded 0%	
Maximum Detection		2.38E+05		Minimum Detection 9.78E+02	
Maximum Non-detection <sup>1</sup>		All Detects		Minimum Non-detection <sup>1</sup> All Detects	
Normal (Non-transformed) Results					
Normal Mean		1.95E+04		Mean Standard Error 9.90E+03	
Standard Deviation		4.85E+04		Coefficient of Variance (%) 248%	
Dataset Skewness		Fail	3.81E+00	Dataset Kurtosis Fail 1.72E+01	
Tested for Normality		W-Test		NormalityResult (a = 0.05) Fail	
Critical Value		9.16E-01		Calculated Value for dataset 3.93E-01	
90% UCL using t-statistic		3.26E+04		95% UCL using -t-statistic 3.65E+04	
Natural Log-Transformed Results					
MVUE of the log-mean		1.40E+04		Standard error of the log-mean 4.60E+03	
Standard Deviation		1.34E+00		Coefficient of Variance (%) 15%	
Dataset Skewness		Pass	9.54E-01	Dataset Kurtosis Pass 3.20E+00	
Tested for Normality		W-Test		Normality Result (a = 0.05) Fail	
Critical Value		9.16E-01		Calculated Value for dataset 8.97E-01	
Anderson Darling (AD) A <sup>2</sup>		9.93E-01		AD Probability Fail 3.60E-01	
90% UCL of the MVUE		2.76E+04		95% UCL of the MVUE 3.43E+04	
EPA Concentration Term		3.43E+04		Chebychev 95% UCL 3.45E+04	
Jackknife Results					
Jackknifed Mean		1.95E+04		Jackknifed Standard Error 9.90E+03	
90% UCL of the mean		3.26E+04		95% UCL of the mean 3.65E+04	
90% UCL of the MVUE <sup>2</sup>		2.14E+04		95% UCL of the MVUE <sup>2</sup> 2.38E+04	
Bootstrap Results (Raw Data)					
Standard Bootstrap		Mean	1.94E+04	90% UCL	3.13E+04
		Skewness	6.52E-01	Kurtosis	2.98E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap		90% UCL	7.14E+04	95% UCL	9.59E+04
		Skewness	-1.82E+00	Kurtosis	6.45E+00
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap		90% UCL	6.24E+04	95% UCL	9.29E+04
		Skewness	-1.21E+01	Kurtosis	2.46E+02
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Copper Fenceline, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	58.2	
2	12.5	
3	3.45	
4	1.16	J
5	345	
6	250	
7	210	
8	425	
9	17.3	
10	1.8	
11	15.2	
12	203	
13	3.73	
14	1.74	
15	11.6	
16	9.55	
17	2140	
18	76.1	
19	469	
20	1.92	
21	73.1	
22	8.16	J
23	1.3	J
24	4470	

<b>Low-End EPC</b>		MVUE of the log-mean	414.4927928
<b>High-End EPC</b>		UCL based on Jackknifed MVUE	917.4557824
<b>Raw Data Results</b>			
Number of Samples		24	
Percent Detection	100%	24 of 24	Percent Detects J-coded 13%
Maximum Detection	4.47E+03	Minimum Detection	1.16E+00
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	3.67E+02	Mean Standard Error	2.00E+02
Standard Deviation	9.78E+02	Coefficient of Variance (%)	267%
Dataset Skewness	Fail 3.29E+00	Dataset Kurtosis	Fail 1.34E+01
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	4.18E-01
90% UCL using t-statistic	6.31E+02	95% UCL using -t-statistic	7.09E+02
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	4.14E+02	Standard error of the log-mean	2.67E+02
Standard Deviation	2.43E+00	Coefficient of Variance (%)	71%
Dataset Skewness	Pass 3.15E-01	Dataset Kurtosis	Fail 1.87E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	9.16E-01	Calculated Value for dataset	9.41E-01
Anderson Darling (AD) A <sup>2</sup>	4.68E-01	AD Probability	Pass 7.80E-01
90% UCL of the MVUE	3.48E+03	95% UCL of the MVUE	6.66E+03
EPA Concentration Term	6.66E+03	Chebychev 95% UCL	1.61E+03
<b>Jackknife Results</b>			
Jackknifed Mean	3.67E+02	Jackknifed Standard Error	2.00E+02
90% UCL of the mean	6.31E+02	95% UCL of the mean	7.09E+02
90% UCL of the MVUE <sup>2</sup>	8.02E+02	95% UCL of the MVUE <sup>2</sup>	9.17E+02
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean	3.69E+02	90% UCL 6.15E+02 95% UCL 6.85E+02
Skewness	6.38E-01	Kurtosis	3.32E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivotal (t) Bootstrap	90% UCL	1.95E+03	95% UCL 2.40E+03
Skewness	-2.70E+00	Kurtosis	1.18E+01
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL	1.92E+03	95% UCL 2.50E+03
Skewness	-1.78E+01	Kurtosis	3.93E+02
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Cadmium Fenceline, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	47.6	
2	5.44	J
3	92.2	
4	1560	
5	4.85	
6	37.1	
7	2.3	
8	9.28	
9	3.16	
10	0.208	J
11	38.7	
12	0.601	J
13	9.66	
14	0.612	J
15	0.395	J
16	3660	
17	72.5	
18	3.84	
19	322	
20	45.5	
21	2.79	
22	0.375	J
23	0.272	J
24	21.5	

<b>Low-End EPC</b>	MVUE of the log-mean	199.5757526
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	469.2141567

Raw Data Results			
Number of Samples	24		
Percent Detection	100%	24 of 24	Percent Detects J-coded 29%
Maximum Detection	3.66E+03	Minimum Detection	2.08E-01
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects

Normal (Non-transformed) Results			
Normal Mean	2.48E+02	Mean Standard Error	1.62E+02
Standard Deviation	7.94E+02	Coefficient of Variance (%)	321%
Dataset Skewness	Fail 3.48E+00	Dataset Kurtosis	Fail 1.46E+01
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	3.53E-01
90% UCL using t-statistic	4.61E+02	95% UCL using -t-statistic	5.25E+02

Natural Log-Transformed Results			
MVUE of the log-mean	2.00E+02	Standard error of the log-mean	1.39E+02
Standard Deviation	2.65E+00	Coefficient of Variance (%)	117%
Dataset Skewness	Pass 4.38E-01	Dataset Kurtosis	Pass 2.39E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	9.16E-01	Calculated Value for dataset	9.55E-01
Anderson Darling (AD) A <sup>2</sup>	3.10E-01	AD Probability	Pass 9.31E-01
90% UCL of the MVUE	2.56E+03	95% UCL of the MVUE	5.49E+03
EPA Concentration Term	5.49E+03	Chebychev 95% UCL	8.22E+02

Jackknife Results			
Jackknifed Mean	2.48E+02	Jackknifed Standard Error	1.62E+02
90% UCL of the mean	4.61E+02	95% UCL of the mean	5.25E+02
90% UCL of the MVUE <sup>2</sup>	4.03E+02	95% UCL of the MVUE <sup>2</sup>	4.69E+02

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	2.49E+02	90% UCL	4.54E+02	95% UCL 5.12E+02
	Skewness	7.49E-01	Kurtosis	3.48E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap	90% UCL	2.09E+03	95% UCL	2.96E+03	
	Skewness	-4.44E+00	Kurtosis	2.50E+01	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	2.09E+03	95% UCL	7.28E+03	
	Skewness	-1.09E+01	Kurtosis	1.39E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Arsenic

### Fenceline, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	1.19	J
2	1.52	J
3	27.7	
4	4.56	J
5	2.83	
6	117	
7	18	
8	15.8	J
9	2.1	J
10	77.6	
11	31.7	J
12	433	J
13	4.43	
14	3.18	
15	13.4	
16	5.8	UJ
17	34.7	
18	7.5	
19	163	
20	3.29	J
21	5.51	
22	13.9	
23	2.08	J
24	19.6	J

<b>Low-End EPC</b>		MVUE of the log-mean		34.8989045	
<b>High-End EPC</b>		UCL based on Jackknifed MVUE		61.82727407	
<b>Raw Data Results</b>					
Number of Samples		24			
Percent Detection		96%	23 of 24	Percent Detects J-coded 43%	
Maximum Detection		4.33E+02		Minimum Detection 1.19E+00	
Maximum Non-detection <sup>1</sup>		5.80E+00		Minimum Non-detection <sup>1</sup> 5.80E+00	
<b>Normal (Non-transformed) Results</b>					
Normal Mean		4.21E+01		Mean Standard Error 1.88E+01	
Standard Deviation		9.23E+01		Coefficient of Variance (%) 219%	
Dataset Skewness		Fail	3.25E+00	Dataset Kurtosis Fail 1.36E+01	
Tested for Normality		W-Test		NormalityResult (a = 0.05) Fail	
Critical Value		9.16E-01		Calculated Value for dataset 4.79E-01	
90% UCL using t-statistic		6.69E+01		95% UCL using -t-statistic 7.43E+01	
<b>Natural Log-Transformed Results</b>					
MVUE of the log-mean		3.49E+01		Standard error of the log-mean 1.38E+01	
Standard Deviation		1.56E+00		Coefficient of Variance (%) 64%	
Dataset Skewness		Pass	5.64E-01	Dataset Kurtosis Pass 2.39E+00	
Tested for Normality		W-Test		Normality Result (a = 0.05) Pass	
Critical Value		9.16E-01		Calculated Value for dataset 9.53E-01	
Anderson Darling (AD) A <sup>2</sup>		3.66E-01		AD Probability Pass 8.82E-01	
90% UCL of the MVUE		8.50E+01		95% UCL of the MVUE 1.13E+02	
EPA Concentration Term		1.13E+02		Chebychev 95% UCL 9.64E+01	
<b>Jackknife Results</b>					
Jackknifed Mean		4.21E+01		Jackknifed Standard Error 1.88E+01	
90% UCL of the mean		6.69E+01		95% UCL of the mean 7.43E+01	
90% UCL of the MVUE <sup>2</sup>		5.53E+01		95% UCL of the MVUE <sup>2</sup> 6.18E+01	
<b>Bootstrap Results (Raw Data)</b>					
Standard Bootstrap		Mean	4.16E+01	90% UCL	6.45E+01
				95% UCL	7.10E+01
Skewness		6.02E-01		Kurtosis	3.20E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap		90% UCL		1.09E+02	95% UCL 1.44E+02
Skewness		-3.69E+00		Kurtosis	2.26E+01
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap		90% UCL		1.10E+02	95% UCL 1.55E+02
Skewness		-5.52E+00		Kurtosis	4.27E+01
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Antimony Fenceline, Surface Soil

There is a sufficient number of values for statistical analysis - the data were found to be non-normal with high skewness, however, the Hall's transformed t bootstrap failed to normalize the dataset - use the Standard Bootstrap mean and UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	0.214	J
2	3.46	J
3	1.39	J
4	220	
5	273	
6	0.267	J
7	1.04	J
8	11.6	
9	13	
10	1.59	J
11	248	J
12	400	
13	0.515	J
14	5.74	J
15	14.9	
16	2.33	J
17	3.65	
18	0.513	J
19	0.285	J
20	3.03	
21	14.1	
22	1.07	J
23	0.495	J
24	0.471	J

<b>Low-End EPC</b>		Bootstrap Mean	50.10264417
<b>High-End EPC</b>		Standard Bootstrap UCL	85.42734057
<b>Raw Data Results</b>			
Number of Samples	24		
Percent Detection	100%	24 of 24	Percent Detects J-coded 63%
Maximum Detection	4.00E+02	Minimum Detection	2.14E-01
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	5.09E+01	Mean Standard Error	2.26E+01
Standard Deviation	1.11E+02	Coefficient of Variance (%)	218%
Dataset Skewness	Fail 1.95E+00	Dataset Kurtosis	Fail 5.42E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	5.16E-01
90% UCL using t-statistic	8.07E+01	95% UCL using -t-statistic	8.97E+01
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	4.26E+01	Standard error of the log-mean	2.62E+01
Standard Deviation	2.32E+00	Coefficient of Variance (%)	169%
Dataset Skewness	Pass 7.00E-01	Dataset Kurtosis	Pass 2.27E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Fail
Critical Value	9.16E-01	Calculated Value for dataset	8.95E-01
Anderson Darling (AD) A <sup>2</sup>	8.31E-01	AD Probability	Fail 4.58E-01
90% UCL of the MVUE	2.95E+02	95% UCL of the MVUE	5.34E+02
EPA Concentration Term	5.34E+02	Chebychev 95% UCL	1.60E+02
<b>Jackknife Results</b>			
Jackknifed Mean	5.09E+01	Jackknifed Standard Error	2.26E+01
90% UCL of the mean	8.07E+01	95% UCL of the mean	8.97E+01
90% UCL of the MVUE <sup>2</sup>	8.24E+01	95% UCL of the MVUE <sup>2</sup>	9.59E+01
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean	5.01E+01	90% UCL 7.76E+01 95% UCL 8.54E+01
	Skewness	3.86E-01	Kurtosis 3.15E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivotal (t) Bootstrap	90% UCL	9.51E+01	95% UCL 1.33E+02
	Skewness	-1.03E+01	Kurtosis 1.20E+02
Quantile fit is poor do not use Bootstrap Results			
Hall's t Bootstrap	90% UCL	9.17E+01	95% UCL 1.33E+02
	Skewness	-2.81E+01	Kurtosis 8.44E+02
Quantile fit is poor do not use Bootstrap Results			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Arsenic SWMU 10C, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is less than 100% - Use the MVUE of the log-normal mean and H-statistic derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	4.56	J
2	3.18	
3	4.12	
4	4.77	
5	4.43	
6	5.51	
7	7.7	
8	6.1	J
9	17.3	J
10	10.9	

<b>Low-End EPC</b>	MVUE of the log-mean	6.739870756
<b>High-End EPC</b>	UCL based on H-statistic	9.961624718

Raw Data Results			
Number of Samples	10		
Percent Detection	100%	10 of 10	Percent Detects J-coded 30%
Maximum Detection	1.73E+01	Minimum Detection	3.18E+00
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects

Normal (Non-transformed) Results			
Normal Mean	6.86E+00	Mean Standard Error	1.35E+00
Standard Deviation	4.28E+00	Coefficient of Variance (%)	62%
Dataset Skewness	Fail 1.40E+00	Dataset Kurtosis	Pass 3.71E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.42E-01	Calculated Value for dataset	7.67E-01
90% UCL using t-statistic	8.73E+00	95% UCL using t-statistic	9.34E+00

Natural Log-Transformed Results			
MVUE of the log-mean	6.74E+00	Standard error of the log-mean	1.10E+00
Standard Deviation	5.07E-01	Coefficient of Variance (%)	28%
Dataset Skewness	Pass 7.93E-01	Dataset Kurtosis	Pass 2.39E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.42E-01	Calculated Value for dataset	9.12E-01
Anderson Darling (AD) A <sup>2</sup>	4.39E-01	AD Probability	Pass 8.10E-01
90% UCL of the MVUE	8.97E+00	95% UCL of the MVUE	9.96E+00
EPA Concentration Term	9.96E+00	Chebychev 95% UCL	1.17E+01

Jackknife Results			
Jackknifed Mean	6.86E+00	Jackknifed Standard Error	1.35E+00
90% UCL of the mean	8.73E+00	95% UCL of the mean	9.34E+00
90% UCL of the MVUE <sup>2</sup>	8.50E+00	95% UCL of the MVUE <sup>2</sup>	9.09E+00

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	6.86E+00	90% UCL	8.44E+00	95% UCL 8.89E+00
	Skewness	4.55E-01	Kurtosis	3.12E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap	90% UCL	1.04E+01	95% UCL	1.34E+01	
	Skewness	-2.47E+00	Kurtosis	1.20E+01	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	1.11E+01	95% UCL	1.33E+01	
	Skewness	-3.75E+00	Kurtosis	2.48E+01	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Mercury SWMU 14, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	7.24	
2	48.7	
3	0.00165	U
4	4.15	
5	3.7	
6	0.667	
7	8.67	
8	0.0271	J

<b>Low-End EPC</b>	MVUE of the log-mean	41.69046604
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	138.8420662

Raw Data Results			
Number of Samples	8		
Percent Detection	88%	7 of 8	Percent Detects J-coded 14%
Maximum Detection	4.87E+01		Minimum Detection 2.71E-02
Maximum Non-detection <sup>1</sup>	1.65E-03		Minimum Non-detection <sup>1</sup> 1.65E-03

Normal (Non-transformed) Results			
Normal Mean	9.14E+00	Mean Standard Error	5.77E+00
Standard Deviation	1.63E+01	Coefficient of Variance (%)	178%
Dataset Skewness	Fail 1.71E+00	Dataset Kurtosis	Pass 4.36E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.18E-01	Calculated Value for dataset	5.98E-01
90% UCL using t-statistic	1.73E+01	95% UCL using -t-statistic	2.01E+01

Natural Log-Transformed Results			
MVUE of the log-mean	4.17E+01	Standard error of the log-mean	3.81E+01
Standard Deviation	3.42E+00	Coefficient of Variance (%)	8120%
Dataset Skewness	Pass -7.49E-01	Dataset Kurtosis	Pass 1.99E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.18E-01	Calculated Value for dataset	8.80E-01
Anderson Darling (AD) A <sup>2</sup>	5.15E-01	AD Probability	Pass 7.31E-01
90% UCL of the MVUE	2.01E+06	95% UCL of the MVUE	1.59E+08
EPA Concentration Term	1.59E+08	Chebychev 95% UCL	2.12E+02

Jackknife Results			
Jackknifed Mean	9.14E+00	Jackknifed Standard Error	5.77E+00
90% UCL of the mean	1.73E+01	95% UCL of the mean	2.01E+01
90% UCL of the MVUE <sup>2</sup>	1.21E+02	95% UCL of the MVUE <sup>2</sup>	1.39E+02

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	9.07E+00	90% UCL	1.59E+01	95% UCL 1.79E+01
	Skewness	7.68E-01	Kurtosis	3.35E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	4.47E+01	95% UCL	5.14E+01	
	Skewness	-1.47E+00	Kurtosis	5.62E+00	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	4.57E+01	95% UCL	4.68E+01	
	Skewness	-1.39E+01	Kurtosis	2.35E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Zinc SWMU 14, Surface Soil

The data are best described as normally distributed and there were a sufficient number of detected values to perform a statistical analysis. Use the normal mean and t-statistic derived UCLs as EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	565	
2	3660	
3	10400	
4	242	
5	949	
6	1210	
7	3920	
8	2910	
9	8650	
10	14200	
11	10400	

<b>Low-End EPC</b>	Normal Mean	5191.454545
<b>High-End EPC</b>	UCL based on t-statistic	7847.874643

Raw Data Results			
Number of Samples	11		
Percent Detection	100%	11 of 11	Percent Detects J-coded 0%
Maximum Detection	1.42E+04		Minimum Detection 2.42E+02
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	5.19E+03	Mean Standard Error	1.47E+03
Standard Deviation	4.86E+03	Coefficient of Variance (%)	94%
Dataset Skewness	Pass 5.36E-01	Dataset Kurtosis	Fail 1.61E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Pass
Critical Value	8.50E-01	Calculated Value for dataset	8.71E-01
90% UCL using t-statistic	7.20E+03	95% UCL using -t-statistic	7.85E+03

Natural Log-Transformed Results			
MVUE of the log-mean	6.06E+03	Standard error of the log-mean	2.64E+03
Standard Deviation	1.34E+00	Coefficient of Variance (%)	17%
Dataset Skewness	Pass -3.99E-01	Dataset Kurtosis	Fail 1.66E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.50E-01	Calculated Value for dataset	9.31E-01
Anderson Darling (AD) A <sup>2</sup>	3.27E-01	AD Probability	Pass 9.17E-01
90% UCL of the MVUE	2.06E+04	95% UCL of the MVUE	3.29E+04
EPA Concentration Term	3.29E+04	Chebychev 95% UCL	1.78E+04

Jackknife Results			
Jackknifed Mean	5.19E+03	Jackknifed Standard Error	1.47E+03
90% UCL of the mean	7.20E+03	95% UCL of the mean	7.85E+03
90% UCL of the MVUE <sup>2</sup>	9.30E+03	95% UCL of the MVUE <sup>2</sup>	1.02E+04

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	5.15E+03	90% UCL	6.95E+03	95% UCL 7.45E+03
	Skewness	2.53E-01	Kurtosis	2.86E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	7.70E+03	95% UCL	8.76E+03	
	Skewness	-1.08E+00	Kurtosis	7.19E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Hall's t Bootstrap	90% UCL	7.58E+03	95% UCL	8.66E+03	
	Skewness	-1.78E+00	Kurtosis	9.85E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Iron SWMU 14, Surface Soil

The data are best described as normally distributed and there were a sufficient number of detected values to perform a statistical analysis. Use the normal mean and t-statistic derived UCLs as EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	2240	
2	2610	
3	31900	
4	3390	
5	13500	
6	18500	
7	19100	
8	13900	

<b>Low-End EPC</b>	Normal Mean	13142.5
<b>High-End EPC</b>	UCL based on t-statistic	20037.2405

Raw Data Results			
Number of Samples	8		
Percent Detection	100%	8 of 8	Percent Detects J-coded 0%
Maximum Detection	3.19E+04		Minimum Detection 2.24E+03
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	1.31E+04	Mean Standard Error	3.64E+03
Standard Deviation	1.03E+04	Coefficient of Variance (%)	78%
Dataset Skewness	Pass 4.10E-01	Dataset Kurtosis	Pass 1.80E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Pass
Critical Value	8.18E-01	Calculated Value for dataset	8.99E-01
90% UCL using t-statistic	1.83E+04	95% UCL using -t-statistic	2.00E+04

Natural Log-Transformed Results			
MVUE of the log-mean	1.40E+04	Standard error of the log-mean	5.21E+03
Standard Deviation	1.03E+00	Coefficient of Variance (%)	11%
Dataset Skewness	Pass -2.80E-01	Dataset Kurtosis	Fail 1.12E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.18E-01	Calculated Value for dataset	8.61E-01
Anderson Darling (AD) A <sup>2</sup>	5.63E-01	AD Probability	Pass 6.83E-01
90% UCL of the MVUE	3.84E+04	95% UCL of the MVUE	5.91E+04
EPA Concentration Term	5.91E+04	Chebychev 95% UCL	3.73E+04

Jackknife Results			
Jackknifed Mean	1.31E+04	Jackknifed Standard Error	3.64E+03
90% UCL of the mean	1.83E+04	95% UCL of the mean	2.00E+04
90% UCL of the MVUE <sup>2</sup>	2.05E+04	95% UCL of the MVUE <sup>2</sup>	2.26E+04

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	1.31E+04	90% UCL	1.74E+04	95% UCL 1.86E+04
	Skewness	1.31E-01	Kurtosis	2.97E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	1.86E+04	95% UCL	2.22E+04	
	Skewness	-1.84E+01	Kurtosis	4.83E+02	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	1.86E+04	95% UCL	2.20E+04	
	Skewness	-3.15E+01	Kurtosis	9.94E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Cadmium SWMU 14, Surface Soil

The data are best described as normally distributed and there were a sufficient number of detected values to perform a statistical analysis. Use the normal mean and t-statistic derived UCLs as EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	2.79	
2	22.2	
3	25.5	
4	0.395	J
5	22.7	
6	0.272	J
7	92.2	
8	9.66	
9	37.1	
10	72.5	
11	38.7	

<b>Low-End EPC</b>		Normal Mean	29.45609091
<b>High-End EPC</b>		UCL based on t-statistic	45.71012528
<b>Raw Data Results</b>			
Number of Samples		11	
Percent Detection	100%	11 of 11	Percent Detects J-coded 18%
Maximum Detection	9.22E+01	Minimum Detection	2.72E-01
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects
<b>Normal (Non-transformed) Results</b>			
Normal Mean	2.95E+01	Mean Standard Error	8.97E+00
Standard Deviation	2.97E+01	Coefficient of Variance (%)	101%
Dataset Skewness	Pass 8.68E-01	Dataset Kurtosis	Pass 2.44E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Pass
Critical Value	8.50E-01	Calculated Value for dataset	8.69E-01
90% UCL using t-statistic	4.18E+01	95% UCL using -t-statistic	4.57E+01
<b>Natural Log-Transformed Results</b>			
MVUE of the log-mean	5.52E+01	Standard error of the log-mean	3.50E+01
Standard Deviation	1.99E+00	Coefficient of Variance (%)	82%
Dataset Skewness	Pass -8.22E-01	Dataset Kurtosis	Pass 2.08E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Fail
Critical Value	8.50E-01	Calculated Value for dataset	8.48E-01
Anderson Darling (AD) A <sup>2</sup>	7.39E-01	AD Probability	Pass 5.26E-01
90% UCL of the MVUE	7.50E+02	95% UCL of the MVUE	2.02E+03
EPA Concentration Term	2.02E+03	Chebychev 95% UCL	2.11E+02
<b>Jackknife Results</b>			
Jackknifed Mean	2.95E+01	Jackknifed Standard Error	8.97E+00
90% UCL of the mean	4.18E+01	95% UCL of the mean	4.57E+01
90% UCL of the MVUE <sup>2</sup>	9.76E+01	95% UCL of the MVUE <sup>2</sup>	1.07E+02
<b>Bootstrap Results (Raw Data)</b>			
Standard Bootstrap	Mean	2.93E+01	90% UCL 4.02E+01 95% UCL 4.33E+01
	Skewness	5.52E-01	Kurtosis 3.43E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Pivitol (t) Bootstrap	90% UCL	4.59E+01	95% UCL 5.37E+01
	Skewness	-8.00E-01	Kurtosis 4.79E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			
Hall's t Bootstrap	90% UCL	4.27E+01	95% UCL 5.53E+01
	Skewness	-1.13E+00	Kurtosis 7.20E+00
Quantile fit is good - Bootstrap Output is Normal or nearly so			

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Arsenic

### SWMU 14, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	31.7	J
2	15.8	J
3	19.6	J
4	2360	
5	270	
6	2770	
7	27.7	
8	13.4	
9	77.6	
10	2.08	J
11	1.19	J

<b>Low-End EPC</b>	MVUE of the log-mean	479.5904634
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	1252.752316

Raw Data Results			
Number of Samples	11		
Percent Detection	100%	11 of 11	Percent Detects J-coded 45%
Maximum Detection	2.77E+03	Minimum Detection	1.19E+00
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects

Normal (Non-transformed) Results			
Normal Mean	5.08E+02	Mean Standard Error	3.09E+02
Standard Deviation	1.02E+03	Coefficient of Variance (%)	202%
Dataset Skewness	Fail 1.44E+00	Dataset Kurtosis	Pass 3.17E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.50E-01	Calculated Value for dataset	5.49E-01
90% UCL using t-statistic	9.32E+02	95% UCL using -t-statistic	1.07E+03

Natural Log-Transformed Results			
MVUE of the log-mean	4.80E+02	Standard error of the log-mean	3.63E+02
Standard Deviation	2.50E+00	Coefficient of Variance (%)	66%
Dataset Skewness	Pass 3.55E-01	Dataset Kurtosis	Pass 1.90E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.50E-01	Calculated Value for dataset	9.29E-01
Anderson Darling (AD) A <sup>2</sup>	3.70E-01	AD Probability	Pass 8.78E-01
90% UCL of the MVUE	3.10E+04	95% UCL of the MVUE	1.45E+05
EPA Concentration Term	1.45E+05	Chebychev 95% UCL	2.10E+03

Jackknife Results			
Jackknifed Mean	5.08E+02	Jackknifed Standard Error	3.09E+02
90% UCL of the mean	9.32E+02	95% UCL of the mean	1.07E+03
90% UCL of the MVUE <sup>2</sup>	1.05E+03	95% UCL of the MVUE <sup>2</sup>	1.25E+03

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	5.00E+02	90% UCL	8.66E+02	95% UCL 9.70E+02
	Skewness	5.41E-01	Kurtosis	3.42E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	4.32E+03	95% UCL	6.94E+03	
	Skewness	-6.54E+00	Kurtosis	5.32E+01	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	4.34E+03	95% UCL	6.93E+03	
	Skewness	-1.18E+01	Kurtosis	1.76E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Zinc

### AOC 6, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	23700	
2	1490	
3	1580	
4	178	
5	28800	
6	183	
7	129000	J

<b>Low-End EPC</b>	MVUE of the log-mean	33483.20689
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	96326.63687

#### Raw Data Results

Number of Samples	7		
Percent Detection	100%	7 of 7	Percent Detects J-coded 14%
Maximum Detection	1.29E+05	Minimum Detection	1.78E+02
Maximum Non-detection <sup>1</sup>	All Detects	Minimum Non-detection <sup>1</sup>	All Detects

#### Normal (Non-transformed) Results

Normal Mean	2.64E+04	Mean Standard Error	1.77E+04
Standard Deviation	4.68E+04	Coefficient of Variance (%)	177%
Dataset Skewness	Fail 1.41E+00	Dataset Kurtosis	Pass 3.34E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.03E-01	Calculated Value for dataset	6.45E-01
90% UCL using t-statistic	5.19E+04	95% UCL using -t-statistic	6.08E+04

#### Natural Log-Transformed Results

MVUE of the log-mean	3.35E+04	Standard error of the log-mean	2.74E+04
Standard Deviation	2.58E+00	Coefficient of Variance (%)	32%
Dataset Skewness	Pass 7.63E-02	Dataset Kurtosis	Fail 1.15E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	9.07E-01
Anderson Darling (AD) A <sup>2</sup>	3.36E-01	AD Probability	Pass 9.10E-01
90% UCL of the MVUE	3.55E+07	95% UCL of the MVUE	8.70E+08
EPA Concentration Term	8.70E+08	Chebychev 95% UCL	1.56E+05

#### Jackknife Results

Jackknifed Mean	2.64E+04	Jackknifed Standard Error	1.77E+04
90% UCL of the mean	5.19E+04	95% UCL of the mean	6.08E+04
90% UCL of the MVUE <sup>2</sup>	8.04E+04	95% UCL of the MVUE <sup>2</sup>	9.63E+04

#### Bootstrap Results (Raw Data)

Standard Bootstrap	Mean	2.63E+04	90% UCL	4.70E+04	95% UCL	5.29E+04
	Skewness	6.54E-01	Kurtosis	3.11E+00		
Quantile fit is good - Bootstrap Output is Normal or nearly so						
Pivitol (t) Bootstrap	90% UCL	1.13E+05	95% UCL	1.56E+05		
	Skewness	-8.26E+00	Kurtosis	7.28E+01		
Quantile fit is poor do not use Bootstrap Results						
Hall's t Bootstrap	90% UCL	1.12E+05	95% UCL	1.57E+05		
	Skewness	-2.83E+01	Kurtosis	8.51E+02		
Quantile fit is poor do not use Bootstrap Results						

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Thallium AOC 6, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	1.04	
2	1.1	
3	7.21	
4	0.429	J
5	0.474	J
6	1.52	
7	7.02	

<b>Low-End EPC</b>	MVUE of the log-mean	2.575690575
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	5.031534109

Raw Data Results			
Number of Samples	7		
Percent Detection	100%	7 of 7	Percent Detects J-coded 29%
Maximum Detection	7.21E+00		Minimum Detection 4.29E-01
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	2.68E+00	Mean Standard Error	1.15E+00
Standard Deviation	3.05E+00	Coefficient of Variance (%)	114%
Dataset Skewness	Pass 7.14E-01	Dataset Kurtosis	Fail 1.38E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.03E-01	Calculated Value for dataset	7.06E-01
90% UCL using t-statistic	4.34E+00	95% UCL using -t-statistic	4.92E+00

Natural Log-Transformed Results			
MVUE of the log-mean	2.58E+00	Standard error of the log-mean	1.12E+00
Standard Deviation	1.15E+00	Coefficient of Variance (%)	280%
Dataset Skewness	Pass 3.56E-01	Dataset Kurtosis	Fail 1.29E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	8.67E-01
Anderson Darling (AD) A <sup>2</sup>	4.37E-01	AD Probability	Pass 8.12E-01
90% UCL of the MVUE	1.06E+01	95% UCL of the MVUE	2.06E+01
EPA Concentration Term	2.06E+01	Chebychev 95% UCL	7.58E+00

Jackknife Results			
Jackknifed Mean	2.68E+00	Jackknifed Standard Error	1.15E+00
90% UCL of the mean	4.34E+00	95% UCL of the mean	4.92E+00
90% UCL of the MVUE <sup>2</sup>	4.37E+00	95% UCL of the MVUE <sup>2</sup>	5.03E+00

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	2.69E+00	90% UCL	4.04E+00	95% UCL 4.43E+00
	Skewness	3.55E-01	Kurtosis	2.89E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	4.30E+00	95% UCL	1.67E+01	
	Skewness	-2.79E+00	Kurtosis	1.03E+01	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	4.30E+00	95% UCL	1.77E+01	
	Skewness	-7.60E+00	Kurtosis	7.01E+01	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Iron AOC 6, Surface Soil

The data are best described as normally distributed and there were a sufficient number of detected values to perform a statistical analysis. Use the normal mean and t-statistic derived UCLs as EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	12600	
2	41200	
3	46300	
4	12700	
5	32000	
6	26600	
7	55100	

<b>Low-End EPC</b>	Normal Mean	32357.14286
<b>High-End EPC</b>	UCL based on t-statistic	44350.17645

Raw Data Results			
Number of Samples	7		
Percent Detection	100%	7 of 7	Percent Detects J-coded 0%
Maximum Detection	5.51E+04		Minimum Detection 1.26E+04
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	3.24E+04	Mean Standard Error	6.17E+03
Standard Deviation	1.63E+04	Coefficient of Variance (%)	50%
Dataset Skewness	Pass -1.09E-02	Dataset Kurtosis	Fail 1.23E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	9.37E-01
90% UCL using t-statistic	4.12E+04	95% UCL using -t-statistic	4.44E+04

Natural Log-Transformed Results			
MVUE of the log-mean	3.28E+04	Standard error of the log-mean	7.46E+03
Standard Deviation	5.98E-01	Coefficient of Variance (%)	6%
Dataset Skewness	Pass -3.75E-01	Dataset Kurtosis	Fail 1.25E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	8.80E-01
Anderson Darling (AD) A <sup>2</sup>	3.95E-01	AD Probability	Pass 8.54E-01
90% UCL of the MVUE	5.28E+04	95% UCL of the MVUE	6.47E+04
EPA Concentration Term	6.47E+04	Chebychev 95% UCL	6.61E+04

Jackknife Results			
Jackknifed Mean	3.24E+04	Jackknifed Standard Error	6.17E+03
90% UCL of the mean	4.12E+04	95% UCL of the mean	4.44E+04
90% UCL of the MVUE <sup>2</sup>	4.24E+04	95% UCL of the MVUE <sup>2</sup>	4.57E+04

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	3.22E+04	90% UCL	3.95E+04	95% UCL 4.16E+04
	Skewness	4.01E-02	Kurtosis	2.81E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap	90% UCL	4.21E+04	95% UCL	4.52E+04	
	Skewness	5.33E-01	Kurtosis	8.72E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Hall's t Bootstrap	90% UCL	4.24E+04	95% UCL	4.63E+04	
	Skewness	5.45E-01	Kurtosis	2.11E+01	
Quantile fit is good - Bootstrap Output is Normal or nearly so					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Chromium

### AOC 6, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	25.5	
2	40.7	
3	454	
4	3.85	
5	4.01	
6	13.6	
7	15.3	

<b>Low-End EPC</b>	MVUE of the log-mean	56.02502653
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	126.1362212

Raw Data Results			
Number of Samples	7		
Percent Detection	100%	7 of 7	Percent Detects J-coded 0%
Maximum Detection	4.54E+02		Minimum Detection 3.85E+00
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	7.96E+01	Mean Standard Error	6.26E+01
Standard Deviation	1.66E+02	Coefficient of Variance (%)	208%
Dataset Skewness	Fail 1.60E+00	Dataset Kurtosis	Pass 3.75E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.03E-01	Calculated Value for dataset	5.23E-01
90% UCL using t-statistic	1.70E+02	95% UCL using -t-statistic	2.01E+02

Natural Log-Transformed Results			
MVUE of the log-mean	5.60E+01	Standard error of the log-mean	3.32E+01
Standard Deviation	1.62E+00	Coefficient of Variance (%)	54%
Dataset Skewness	Pass 7.00E-01	Dataset Kurtosis	Pass 2.20E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	8.95E-01
Anderson Darling (AD) A <sup>2</sup>	3.65E-01	AD Probability	Pass 8.83E-01
90% UCL of the MVUE	8.48E+02	95% UCL of the MVUE	3.07E+03
EPA Concentration Term	3.07E+03	Chebychev 95% UCL	2.04E+02

Jackknife Results			
Jackknifed Mean	7.96E+01	Jackknifed Standard Error	6.26E+01
90% UCL of the mean	1.70E+02	95% UCL of the mean	2.01E+02
90% UCL of the MVUE <sup>2</sup>	1.05E+02	95% UCL of the MVUE <sup>2</sup>	1.26E+02

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	7.95E+01	90% UCL	1.54E+02	95% UCL 1.76E+02
	Skewness	7.98E-01	Kurtosis	3.57E+00	
Quantile fit is poor do not use Bootstrap Results					
Pivitol (t) Bootstrap	90% UCL	1.07E+03	95% UCL		1.55E+03
	Skewness	-1.61E+00	Kurtosis	5.85E+00	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	8.96E+02	95% UCL		1.59E+03
	Skewness	-2.68E+01	Kurtosis	7.86E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Cadmium

### AOC 6, Surface Soil

The data are best described as log-normally distributed and there were a sufficient number of detected values to perform statistical analysis. The CV is > 100% - Use the MVUE of the log-normal mean and Jackknife derived UCLs as the EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	4.85	
2	0.878	
3	5.08	
4	1.02	
5	47.4	
6	53.7	
7	67.8	

<b>Low-End EPC</b>	MVUE of the log-mean	31.61312609
<b>High-End EPC</b>	UCL based on Jackknifed MVUE	75.26126192

Raw Data Results			
Number of Samples	7		
Percent Detection	100%	7 of 7	Percent Detects J-coded 0%
Maximum Detection	6.78E+01		Minimum Detection 8.78E-01
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	2.58E+01	Mean Standard Error	1.10E+01
Standard Deviation	2.92E+01	Coefficient of Variance (%)	113%
Dataset Skewness	Pass 3.26E-01	Dataset Kurtosis	Fail 9.98E-01
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Fail
Critical Value	8.03E-01	Calculated Value for dataset	7.92E-01
90% UCL using t-statistic	4.17E+01	95% UCL using -t-statistic	4.73E+01

Natural Log-Transformed Results			
MVUE of the log-mean	3.16E+01	Standard error of the log-mean	2.09E+01
Standard Deviation	1.87E+00	Coefficient of Variance (%)	86%
Dataset Skewness	Pass -6.14E-02	Dataset Kurtosis	Fail 1.01E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	8.57E-01
Anderson Darling (AD) A <sup>2</sup>	4.64E-01	AD Probability	Pass 7.84E-01
90% UCL of the MVUE	1.14E+03	95% UCL of the MVUE	6.14E+03
EPA Concentration Term	6.14E+03	Chebychev 95% UCL	1.25E+02

Jackknife Results			
Jackknifed Mean	2.58E+01	Jackknifed Standard Error	1.10E+01
90% UCL of the mean	4.17E+01	95% UCL of the mean	4.73E+01
90% UCL of the MVUE <sup>2</sup>	6.45E+01	95% UCL of the MVUE <sup>2</sup>	7.53E+01

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	2.60E+01	90% UCL	3.93E+01	95% UCL 4.31E+01
	Skewness	1.81E-01	Kurtosis	2.85E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivitol (t) Bootstrap	90% UCL	4.33E+01	95% UCL	5.54E+01	
	Skewness	-3.06E+01	Kurtosis	9.55E+02	
Quantile fit is poor do not use Bootstrap Results					
Hall's t Bootstrap	90% UCL	4.33E+01	95% UCL	5.54E+01	
	Skewness	-3.16E+01	Kurtosis	9.98E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

# RECOMMENDED ENVIRONMENTAL EXPOSURE POINT CONCENTRATIONS (EPCs)

## Barium AOC 6, Surface Soil

The data are best described as normally distributed and there were a sufficient number of detected values to perform a statistical analysis. Use the normal mean and t-statistic derived UCLs as EPCs

(Nondetect data presented as 1/2 the DL)

Units = PPM

Sample#	Value	Qualifier
1	11300	J
2	4070	J
3	2940	J
4	175	J
5	13900	J
6	111	J
7	7980	J

<b>Low-End EPC</b>	Normal Mean	5782.285714
<b>High-End EPC</b>	UCL based on t-statistic	9757.70666

Raw Data Results			
Number of Samples	7		
Percent Detection	100%	7 of 7	Percent Detects J-coded 100%
Maximum Detection	1.39E+04		Minimum Detection 1.11E+02
Maximum Non-detection <sup>1</sup>	All Detects		Minimum Non-detection <sup>1</sup> All Detects

Normal (Non-transformed) Results			
Normal Mean	5.78E+03	Mean Standard Error	2.05E+03
Standard Deviation	5.41E+03	Coefficient of Variance (%)	94%
Dataset Skewness	Pass 2.94E-01	Dataset Kurtosis	Fail 1.23E+00
Tested for Normality	W-Test	NormalityResult (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	9.14E-01
90% UCL using t-statistic	8.73E+03	95% UCL using -t-statistic	9.76E+03

Natural Log-Transformed Results			
MVUE of the log-mean	9.41E+03	Standard error of the log-mean	6.50E+03
Standard Deviation	1.98E+00	Coefficient of Variance (%)	26%
Dataset Skewness	Pass -5.78E-01	Dataset Kurtosis	Fail 1.35E+00
Tested for Normality	W-Test	Normality Result (a = 0.05)	Pass
Critical Value	8.03E-01	Calculated Value for dataset	8.28E-01
Anderson Darling (AD) A <sup>2</sup>	5.74E-01	AD Probability	Pass 6.72E-01
90% UCL of the MVUE	5.33E+05	95% UCL of the MVUE	3.55E+06
EPA Concentration Term	3.55E+06	Chebychev 95% UCL	3.85E+04

Jackknife Results			
Jackknifed Mean	5.78E+03	Jackknifed Standard Error	2.05E+03
90% UCL of the mean	8.73E+03	95% UCL of the mean	9.76E+03
90% UCL of the MVUE <sup>2</sup>	1.76E+04	95% UCL of the MVUE <sup>2</sup>	1.96E+04

Bootstrap Results (Raw Data)					
Standard Bootstrap	Mean	5.66E+03	90% UCL	8.10E+03	95% UCL 8.80E+03
	Skewness	1.85E-01	Kurtosis	2.87E+00	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Pivotal (t) Bootstrap	90% UCL	9.74E+03	95% UCL	1.17E+04	
	Skewness	-2.12E+00	Kurtosis	1.60E+01	
Quantile fit is good - Bootstrap Output is Normal or nearly so					
Hall's t Bootstrap	90% UCL	9.49E+03	95% UCL	1.06E+04	
	Skewness	-1.81E+01	Kurtosis	3.73E+02	
Quantile fit is poor do not use Bootstrap Results					

1 = Equals 1/2 of the reporting limit  
2 = Using the Jackknife

EPC=Environmental Exposure Concentration  
MVUE=Minimum Variance Unbiased Estimator  
UCL=Upper Confidence Interval

**APPENDIX E**  
**GROUNDWATER SAMPLING RESULTS**

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-02	MW-02	MW-02	MW-02	MW-02	MW-02	MW-02	MW-02
				Date	3/22/00	7/21/00	11/3/00	3/23/01	4/23/02	7/15/02	12/11/97	9/16/98
				Top (ft)								
		Total (T)/	Screening	Bottom (ft)								
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINIUM	ug/l	D			<77	<19.0	<19.0	22.3 U			<44	<52
ANTIMONY	ug/l	D	6		<8.4	<9.4	<9.4	<9.4			^6.2 J	<5.3
ARSENIC	ug/l	D	10		^113	^112	^114	^113	^88.2	^141	^110	^106
BARIUM	ug/l	D	2000		33.4	29.4 J	28.5	31.2			27.2	27.6
CADMIUM	ug/l	D	5		<.81	<.90	1.6	<.64	<.94 U	<.94 U	<.42	<.63
CALCIUM	ug/l	D			476000	515000	514000	519000			480000	500000
CHROMIUM	ug/l	D	100		<1.7	1.9 J	<1.6	<1.6			<1.3	<1.7
COPPER	ug/l	D	1300		<2.9	<1.9	<1.9	<1.9			3.3 J	<1.7
IRON	ug/l	D			55600	61500	63400	61800			59600	61400
LEAD	ug/l	D	15		<7.9	<9.8	<9.8	<9.8	<8.9 U	<8.9 U	<3.4	<6.5
MAGNESIUM	ug/l	D			80100	85400	86300	86400			104000	95500
MANGANESE	ug/l	D			334	371	372	379 J			363	374
MERCURY	ug/l	D	2		<.10	<.048	<.12	<.12			.025 J	<.042
NICKEL	ug/l	D			<1.6	<1.9	<1.9	<1.9			1.8 J	<3.0
SELENIUM	ug/l	D	50		<4.4	5.0 J	<3.5	<3.5			<3.7	<5.9
SODIUM	ug/l	D			132000	124000	125000	119000			117000	112000
VANADIUM	ug/l	D			<1.9	5.9	2.6 J	<1.5			<1.0	1.6 J
ZINC	ug/l	D			<3.0	7.9 U	5.2 U	3.8 U	10.8 J	<4.9 U	14.5 J	19.4 J
BORON	ug/l	D			193	199	206	217			226	216

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-02	MW-02	MW-09	MW-09	MW-09	MW-09	MW-09	MW-09
				Date	6/10/99	11/9/99	3/22/00	7/21/00	11/3/00	3/23/01	4/23/02	7/15/02
				Top (ft)								
		Total (T)/	Screening	Bottom (ft)								
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D			<52	<77	<77	<19.0	30.2 U	44.2 U		
ANTIMONY	ug/l	D	6		<5.3	<8.4	<8.4	<9.4	<9.4	<9.4		
ARSENIC	ug/l	D	10		^88	^113	^74 R	^121	^124	^83.9	^11.6	^162
BARIUM	ug/l	D	2000		27.8	32.0 J	29.3	27.2 J	24.5	25.2		
CADMIUM	ug/l	D	5		<.63	1.36 J	<.81	<.90	2.3 J	<.64	<.94 U	<.94 U
CALCIUM	ug/l	D			434000	508000	563000	641000	590000	580000		
CHROMIUM	ug/l	D	100		<1.7	2.2 U	<1.7	<1.6	<1.6	<1.6		
COPPER	ug/l	D	1300		<1.7	<2.9	<2.9	<1.9	<1.9	<1.9		
IRON	ug/l	D			55800	62900	80800	83000	81000	80200		
LEAD	ug/l	D	15		<6.5	<7.9	<7.9	<9.8	<9.8	<9.8	<8.9 U	<8.9 U
MAGNESIUM	ug/l	D			86300	87000	154000	218000	201000	217000		
MANGANESE	ug/l	D			339	358	3990	2940	2980	2930 J		
MERCURY	ug/l	D	2		<.042	<.10 UJ	<.10	<.048	<.12	<.12		
NICKEL	ug/l	D			<3.0	<1.6	81.7 R	114	80.6	63.8		
SELENIUM	ug/l	D	50		<5.9	<4.4	<4.4	5.2 J	5.5 J	<3.5		
SODIUM	ug/l	D			125000	124000	298000 R	725000	625000	637000		
VANADIUM	ug/l	D			<1.1	<1.9	<1.9	6.8	2.5 J	<1.5		
ZINC	ug/l	D			24	5.1 U	28900 R	38600 J	28200 J	22700	1190	5390
BORON	ug/l	D			204	205	977	1570	1500	1490		

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-09	MW-09	MW-09	MW-09	MW-09	MW-09	MW-10	MW-10
				Date	12/12/97	12/12/97	9/16/98	9/16/98	6/9/99	11/9/99	3/22/00	7/21/00
				Top (ft)								
		Total (T)/	Screening	Bottom (ft)								
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	2	1	2	1	1	1	1
ALUMINIUM	ug/l	D			<44	<44	<52	<52	<52	<77	<77	<19.0
ANTIMONY	ug/l	D	6		<4.1	<4.1	<5.3	<5.3	<5.3	<8.4	<8.4	<9.4
ARSENIC	ug/l	D	10		<5.0	<5.0	^21	^18	^77	^97	^256	^344
BARIUM	ug/l	D	2000		31.9	27.2	25.2	25	28.2	33.5 J	77	78.8 J
CADMIUM	ug/l	D	5		<.42	<.42	<.63	<.63	<.63	2.6 J	<.81	<.90
CALCIUM	ug/l	D			772000	826000	613000	605000	533000	684000	579000	587000
CHROMIUM	ug/l	D	100		<1.3	<1.3	<1.7	<1.7	<1.7	2.1 U	<1.7	<1.6
COPPER	ug/l	D	1300		<1.4	<1.4	4.5	<1.7	<1.7	<2.9	<2.9	<1.9
IRON	ug/l	D			<33	<33	44400	30300	78800	113000	43600	58700
LEAD	ug/l	D	15		<3.4	<3.4	<6.5	<6.5	<6.5	<7.9	<7.9	<9.8
MAGNESIUM	ug/l	D			236000	240000	233000	245000	212000	216000	32800	37600
MANGANESE	ug/l	D			4950	4830	3820	3660	4030	3980	635	676
MERCURY	ug/l	D	2		<.023	<.023	.076 J	<.042	<.042	<.10 UJ	<.10	<.048
NICKEL	ug/l	D			95.9	92.7	19.7	16.7	146	78.8	<1.6	<1.9
SELENIUM	ug/l	D	50		<3.7	<3.7	<5.9	<5.9	<5.9	<4.4	<4.4	4.5 J
SODIUM	ug/l	D			676000	681000	265000	265000	360000	668000	398000	394000
VANADIUM	ug/l	D			<1.0	<1.0	<1.1	<1.1	<1.1	<1.9 UJ	<1.9	5.7
ZINC	ug/l	D			27400	27500	8980	6780	48900	27400	<3.0	5.6 U
BORON	ug/l	D			1830	1780	1340	1350	1100	1430	298	308

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10
				Date	11/3/00	3/23/01	4/23/02	7/15/02	10/1/02	12/15/97	9/17/98	6/10/99
				Top (ft)								
		Total (T)/	Screening	Bottom (ft)								
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D			<19.0	22.4 U				<44	<52	<52
ANTIMONY	ug/l	D	6		<9.4	<9.4				<4.1	<5.3	<5.3
ARSENIC	ug/l	D	10		^361	^323	^17.6	^319	^411	^366	^15	^340
BARIUM	ug/l	D	2000		80.2	79				72.4	30.9	61.3
CADMIUM	ug/l	D	5		1.4 J	<.64	<.94 U	<.94 U	<.94 U	1.05 J	<.63	<.63
CALCIUM	ug/l	D			575000	624000				612000	558000	594000
CHROMIUM	ug/l	D	100		<1.6	<1.6				<1.3	<1.7	<1.7
COPPER	ug/l	D	1300		<1.9	<1.9				<1.4	<1.7	2.2 J
IRON	ug/l	D			59700	58400				58300	4500	57700
LEAD	ug/l	D	15		<9.8	<9.8	<8.9 U	<8.9 U	<8.9 U	<3.4	<6.5	<6.5
MAGNESIUM	ug/l	D			38300	42100				29000	16700	35400
MANGANESE	ug/l	D			696	633 J				709	815	735
MERCURY	ug/l	D	2		<.12	<.12				.044 J	.065 J	<.042
NICKEL	ug/l	D			<1.9	<1.9				<1.6	<3.0	<3.0
SELENIUM	ug/l	D	50		<3.5	<3.5				<3.7	<5.9	<5.9
SODIUM	ug/l	D			401000	491000				342000	100000	397000
VANADIUM	ug/l	D			2.8 J	<1.5				<1.0	<1.1	<1.1
ZINC	ug/l	D			10.6 U	4.8 U	9.3 J	6.2 J	<4.9 U	<4.9	23	23
BORON	ug/l	D			344	347				286	281	309

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10
				Date	11/9/99	11/18/03	3/23/04	7/13/04	9/22/04	12/16/04	3/29/05	7/11/05
				Top (ft)		0	0	0	0	0	0	0
		Total (T)/	Screening	Bottom (ft)		0	0	0	0	0	0	0
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINIUM	ug/l	D			<77							
ANTIMONY	ug/l	D	6		<8.4	<8.5 U	<8.5 U	<9.2 U	<9.2 U	<9.2 U	<9.2 U	<6.4 U
ARSENIC	ug/l	D	10		^348	^365	^45.4	^346	^351	^380	^282	^362 J
BARIUM	ug/l	D	2000		78.8 J	54.2	48	69	70.7	66.5	64	77.7
CADMIUM	ug/l	D	5		1.30 J	<.87 U	<.87 U	<.76 U	<.76 U	<.76 U	<.76 U	<.97 U
CALCIUM	ug/l	D			590000							
CHROMIUM	ug/l	D	100		3.2 U	<2.2 U	<2.2 U	<2.5 U	<2.5 U	<2.5 U	<2.5 U	<4.8 U
COPPER	ug/l	D	1300		<2.9	<2.1 U	<2.1 U	<2.7 U	<2.7 U	<2.7 U	<2.7 U	<1.8 U
IRON	ug/l	D			57000							
LEAD	ug/l	D	15		<7.9	<9.3 U	<9.3 U	<10.0 U	<10.0 U	<10.0 U	<10.0 U	<8.4 U
MAGNESIUM	ug/l	D			33300							
MANGANESE	ug/l	D			695							
MERCURY	ug/l	D	2		<.10 UJ							
NICKEL	ug/l	D			2.7 U	<3.8 U	<3.8 U	<3.1 U	<3.1 U	<3.1 U	4.8 B	<5.8 U
SELENIUM	ug/l	D	50		<4.4	<4.7 U	<4.7 U	<5.9 U	<5.9 U	<5.9 U	<5.9 U	<9.4 U
SODIUM	ug/l	D			354000							
VANADIUM	ug/l	D			<1.9	<1.7 U	<1.7 U	<1.6 U	<1.6 U	<1.6 U	<1.6 U	<1.0 U
ZINC	ug/l	D			6.6 U	<4.1 U	<4.1 U	<4.8 U	14.7 B	5.2 J	5.3 J	7.2 B
BORON	ug/l	D			287							

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-10	MW-10	MW-10	MW-10	MW-2	MW-2	MW-2	MW-2
				Date	9/28/05	12/7/05	3/14/06	6/13/06	10/1/02	11/21/03	3/23/04	7/13/04
				Top (ft)	0	0	0	0		0	0	0
				Bottom (ft)	0	0	0	0		0	0	0
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D										
ANTIMONY	ug/l	D	6		<6.4 U	<6.4 U	<6.4 U	<9.7 U		<8.5 U	<8.5 U	<9.2 U
ARSENIC	ug/l	D	10		^384	^359	^247	^324	^116	^86.0	^119	^98.1
BARIUM	ug/l	D	2000		84.2	73.2	54.7	63.4		36.3	39.3	40.4
CADMIUM	ug/l	D	5		<.97 U	<.97 U	<.97 U	<.91 U	1.6 J	<.87 U	<.87 U	<.76 U
CALCIUM	ug/l	D										
CHROMIUM	ug/l	D	100		<4.8 U	<4.8 U	<4.8 U	<2.3 U		<2.2 U	<2.2 U	<2.5 U
COPPER	ug/l	D	1300		<1.8 U	<1.8 U	<1.8 U	<2.2 U		<2.1 U	<2.1 U	3.3 J
IRON	ug/l	D										
LEAD	ug/l	D	15		<8.4 U	<8.4 U	<8.4 U	<6.9 U	<8.9 U	<9.3 U	<9.3 U	<10.0 U
MAGNESIUM	ug/l	D										
MANGANESE	ug/l	D										
MERCURY	ug/l	D	2									
NICKEL	ug/l	D			<5.8 U	<5.8 U	<5.8 U	<5.6 U		<3.8 U	<3.8 U	<3.1 U
SELENIUM	ug/l	D	50		<9.4 U	<9.4 U	<9.4 U	<9.4 U		<4.7 U	5.6 J	<5.9 U
SODIUM	ug/l	D										
VANADIUM	ug/l	D			<1.0 U	<1.0 U	<1.0 U	<1.5 U		<1.7 U	<1.7 U	<1.6 U
ZINC	ug/l	D			<5.3 U	<5.3 U	<5.3 U	<8.1 U	<4.9 U	<4.1 U	<4.1 U	9.4 J
BORON	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
				Date	9/23/04	12/14/04	12/14/04	3/30/05	7/11/05	12/7/05	3/15/06	3/15/06
				Top (ft)	0	0	0	0	0	0	0	0
		Total (T)/	Screening	Bottom (ft)	0	0	0	0	0	0	0	0
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	2	1	1	1	1	2
ALUMINUM	ug/l	D										
ANTIMONY	ug/l	D	6		<9.2 U	<9.2 U	<9.2 U	<9.2 U	<6.4 U	<6.4 U	<6.4 U	<6.4 U
ARSENIC	ug/l	D	10		^109	^106	^110	^105	^103 J	^98.5	^113	^104
BARIUM	ug/l	D	2000		41.5	42.6	41.6	44.6	39.7	36.3	38.7	38.9
CADMIUM	ug/l	D	5		1.6 J	<.76 U	<.76 U	<.76 U	<.97 U	<.97 U	<.97 U	<.97 U
CALCIUM	ug/l	D										
CHROMIUM	ug/l	D	100		<2.5 U	<2.5 U	<2.5 U	<2.5 U	<4.8 U	<4.8 U	<4.8 U	<4.8 U
COPPER	ug/l	D	1300		<2.7 U	<2.7 U	<2.7 U	<2.7 U	<1.8 U	<1.8 U	<1.8 U	<1.8 U
IRON	ug/l	D										
LEAD	ug/l	D	15		<10.0 U	<10.0 U	<10.0 U	<10.0 U	<8.4 U	<8.4 U	<8.4 U	<8.4 U
MAGNESIUM	ug/l	D										
MANGANESE	ug/l	D										
MERCURY	ug/l	D	2									
NICKEL	ug/l	D			3.6 J	<3.1 U	<3.1 U	<3.1 U	<5.8 U	<5.8 U	<5.8 U	<5.8 U
SELENIUM	ug/l	D	50		<5.9 U	<5.9 U	<5.9 U	<5.9 U	<9.4 U	<9.4 U	<9.4 U	<9.4 U
SODIUM	ug/l	D										
VANADIUM	ug/l	D			<1.6 U	<1.6 U	<1.6 U	<1.6 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
ZINC	ug/l	D			<4.8 U	<4.8 U	<4.8 U	<4.8 U	7.6 B	<5.3 U	<5.3 U	<5.3 U
BORON	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-2	MW-2	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9
				Date	6/13/06	6/13/06	10/1/02	11/21/03	3/23/04	9/22/04	12/14/04	3/28/05
				Top (ft)	0	0		0	0	0	0	0
		Total (T)/	Screening	Bottom (ft)	0	0		0	0	0	0	0
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	2	1	1	1	1	1	1
ALUMINIUM	ug/l	D										
ANTIMONY	ug/l	D	6		<9.7 U	<9.7 U		<8.5 U	<8.5 U	<9.2 U	<9.2 U	<9.2 U
ARSENIC	ug/l	D	10		^109	^108	^61.9	^15.7	^140	^187	^149	^166
BARIUM	ug/l	D	2000		46.2	45.4		43.2	25.7	30	29.2	32.4
CADMIUM	ug/l	D	5		<.91 U	<.91 U	2.9 J	1.1 U	<.87 U	<.76 U	1.1 J	<.76 U
CALCIUM	ug/l	D										
CHROMIUM	ug/l	D	100		<2.3 U	<2.3 U		<2.2 U	<2.2 U	<2.5 U	<2.5 U	<2.5 U
COPPER	ug/l	D	1300		<2.2 U	<2.2 U		<2.1 U	<2.1 U	<2.7 U	<2.7 U	<2.7 U
IRON	ug/l	D										
LEAD	ug/l	D	15		<6.9 U	<6.9 U	<8.9 U	<9.3 U	<9.3 U	<10.0 U	<10.0 U	<10.0 U
MAGNESIUM	ug/l	D										
MANGANESE	ug/l	D										
MERCURY	ug/l	D	2									
NICKEL	ug/l	D			<5.6 U	<5.6 U		<3.8 U	58.6	85.4	16.6	59.2
SELENIUM	ug/l	D	50		<9.4 U	<9.4 U		<4.7 U	<4.7 U	<5.9 U	<5.9 U	<5.9 U
SODIUM	ug/l	D										
VANADIUM	ug/l	D			<1.5 U	<1.5 U		<1.7 U	<1.7 U	<1.6 U	<1.6 U	<1.6 U
ZINC	ug/l	D			<8.1 U	<8.1 U	18.8 J	369	19000	22100	4030	16300
BORON	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 1**  
**Groundwater Pool A East**

				Sample ID	MW-9	MW-9	MW-9	MW-9
				Date	9/26/05	12/6/05	3/15/06	6/13/06
				Top (ft)	0	0	0	0
		Total (T)/	Screening	Bottom (ft)	0	0	0	0
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	1	1
ALUMINUM	ug/l	D						
ANTIMONY	ug/l	D	6		<6.4 U	<6.4 U	<6.4 U	<9.7 U
ARSENIC	ug/l	D	10		^107	^112	^159	^106
BARIUM	ug/l	D	2000		32.7	29	28.1	31.2
CADMIUM	ug/l	D	5		1.3 J	<.97 U	<.97 U	.94 J
CALCIUM	ug/l	D						
CHROMIUM	ug/l	D	100		<4.8 U	<4.8 U	<4.8 U	<2.3 U
COPPER	ug/l	D	1300		<1.8 U	<1.8 U	<1.8 U	<2.2 U
IRON	ug/l	D						
LEAD	ug/l	D	15		<8.4 U	<8.4 U	<8.4 U	<6.9 U
MAGNESIUM	ug/l	D						
MANGANESE	ug/l	D						
MERCURY	ug/l	D	2					
NICKEL	ug/l	D			12.3	11.9	27.4	<5.6 U
SELENIUM	ug/l	D	50		<9.4 U	<9.4 U	<9.4 U	<9.4 U
SODIUM	ug/l	D						
VANADIUM	ug/l	D			<1.0 U	1.0 J	<1.0 U	<1.5 U
ZINC	ug/l	D			1250	4390	8440	1200
BORON	ug/l	D						

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11
				Date	3/20/00	7/20/00	11/2/00	3/22/01	7/16/02	12/15/97	9/23/98	6/10/99
				Top (ft)								
				Bottom (ft)								
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D			<77	<19.0	<19.0	<19.0		<44	<52	<52
ANTIMONY	ug/l	D	6		<8.4	<9.4	<9.4	<9.4		<4.1	<5.3	<5.3
ARSENIC	ug/l	D	10		*11	*20.3	*20.2	*12.8	*33.4	*26	<7.0	9.9 J
BARIUM	ug/l	D	2000		25.2 J	23.4 J	22.8	25.2		22.9	23.8	23.8
BERYLLIUM	ug/l	D	4									
CADMIUM	ug/l	D	5		<.81	<.90	<.90	<.90		<.42	<.63	<.63
CALCIUM	ug/l	D			587000	613000	602000	618000		598000	556000	556000
CHROMIUM	ug/l	D	100		1.8 J	<1.6	<1.6	<1.6		<1.3	<1.7	<1.7
COPPER	ug/l	D	1300		<2.9	<1.9	<1.9	<1.9		<1.4	2.8 J	<1.7
IRON	ug/l	D			10500	18500	16300	11800		12800	320	11300
LEAD	ug/l	D	15		<7.9	<9.8	<9.8	<9.8		<3.4	<6.5	<6.5
MAGNESIUM	ug/l	D			20600	20100	22700	22900		19500	14900	16600
MANGANESE	ug/l	D			614	721	573	652		510	422	508
MERCURY	ug/l	D	2		<.10	<.048	<.12	<.12		<.023	<.042	<.042
NICKEL	ug/l	D			4.2 J	1.9 J	4.5 J	3.9 J		6	8.1	4.9 J
SELENIUM	ug/l	D	50		<4.4	3.8 J	<3.5	<3.5		<3.7	<5.9	<5.9
SILVER	ug/l	D										
SODIUM	ug/l	D			43000	42200	47900	47300		36100	23500	31000
THALLIUM	ug/l	D	2									
VANADIUM	ug/l	D			<1.9	1.6 J	<1.5	<1.5		<1.0	<1.1	<1.1
ZINC	ug/l	D			4500	1950 R	6060 J	4810		8070	10600	7890
BORON	ug/l	D			481	485	519	540		465	391	421
SILICA	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	MW-11	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12
				Date	11/8/99	3/21/00	7/24/00	11/6/00	3/26/01	12/9/97	9/14/98	6/7/99
				Top (ft)								
		Total (T)/	Screening	Bottom (ft)								
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D			<77	<77	<19.0	<19.0	32.1 U	<44	<52	<52
ANTIMONY	ug/l	D	6		<8.4	<8.4	<9.4	<9.4	<9.4	<4.1	<5.3	<5.3
ARSENIC	ug/l	D	10		^23	^61 J	^71.6	^71.7	^45.5	^73	<7.0	^19
BARIUM	ug/l	D	2000		27.5 J	65.1	68.1	69.0 J	82.4	64	53.3	56.4
BERYLLIUM	ug/l	D	4				<.40					
CADMIUM	ug/l	D	5		<.81	<.81	<.90	<.90	<.64	<.42	.81 J	<.63
CALCIUM	ug/l	D			631000	384000 J	308000 J	259000	754000 R	227000	117000	150000
CHROMIUM	ug/l	D	100		3.8 U	3	<1.6	<1.6	<1.6	1.6 J	<1.7	<1.7
COPPER	ug/l	D	1300		<2.9	<2.9	<1.9	<1.9	<1.9	<1.4	3.1 J	<1.7
IRON	ug/l	D			14600	17500 J	17500 J	14500	36400	12000	140	6610
LEAD	ug/l	D	15		<7.9	<7.9	<9.8	<9.8	<9.8	<3.4	<6.5	<6.5
MAGNESIUM	ug/l	D			19800	33400 R	24100 J	18900	80600 R	15800	11300	12500
MANGANESE	ug/l	D			545	802 J	762	674	1470 R	583	98.8	401
MERCURY	ug/l	D	2		<.10 UJ	<.10	<.048	<.12	<.12	<.023	<.042	<.042
NICKEL	ug/l	D			6.9 U	<1.6	<1.9	<1.9	<1.9	<1.6	<3.0	<3.0
SELENIUM	ug/l	D	50		<4.4	<4.4	3.6 J	3.8 J	<3.5	<3.7	<5.9	<5.9
SILVER	ug/l	D					<1.6					
SODIUM	ug/l	D			40000	45300 J	41500 J	32900	91000 R	23300	8220	12600
THALLIUM	ug/l	D	2				<.95					
VANADIUM	ug/l	D			<1.9	<1.9	<1.5	<1.5	<1.5	<1.0	<1.1	<1.1
ZINC	ug/l	D			7720	3.3 J	3.3 J	<3.1	15.8 U	<4.9	14.3 J	13.8 B
BORON	ug/l	D			480	399	398	378	554 J	374	264	333
SILICA	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12	MW-12
				Date	11/10/99	11/18/03	3/23/04	7/13/04	9/22/04	12/15/04	3/29/05	7/12/05
				Top (ft)		0	0	0	0	0	0	0
				Bottom (ft)		0	0	0	0	0	0	0
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D			<77							
ANTIMONY	ug/l	D	6		<8.4	<8.5 U	<8.5 U	<9.2 U	<9.2 U	<9.2 U	<9.2 U	<6.4 U
ARSENIC	ug/l	D	10		*79	<4.9 U	<4.9 U	*23.4	*24.0	<4.7 U	*10.8	*17.6 J
BARIUM	ug/l	D	2000		74.6	36.8	64.7	83.2	95.2	50.2	88.1	103
BERYLLIUM	ug/l	D	4									
CADMIUM	ug/l	D	5		1.31 J	<.87 U	<.87 U	<.76 U	<.76 U	<.76 U	<.76 U	<.97 U
CALCIUM	ug/l	D			284000							
CHROMIUM	ug/l	D	100		<1.7 UJ	<2.2 U	<2.2 U	<2.5 U	<2.5 U	<2.5 U	<2.5 U	<4.8 U
COPPER	ug/l	D	1300		<2.9	<2.1 U	<2.1 U	<2.7 U	<2.7 U	<2.7 U	<2.7 U	<1.8 U
IRON	ug/l	D			14200							
LEAD	ug/l	D	15		<7.9	<9.3 U	<9.3 U	<10.0 U	<10.0 U	<10.0 U	<10.0 U	<8.4 U
MAGNESIUM	ug/l	D			19700							
MANGANESE	ug/l	D			713							
MERCURY	ug/l	D	2		<.10							
NICKEL	ug/l	D			<1.6	<3.8 U	<3.8 U	<3.1 U	4.1 J	<3.1 U	3.2 B	<5.8 U
SELENIUM	ug/l	D	50		<4.4 UJ	<4.7 U	<4.7 U	<5.9 U	<5.9 U	<5.9 U	<5.9 U	<9.4 U
SILVER	ug/l	D										
SODIUM	ug/l	D			33100 J							
THALLIUM	ug/l	D	2									
VANADIUM	ug/l	D			<1.9 UJ	<1.7 U	<1.7 U	<1.6 U	<1.6 U	<1.6 U	<1.6 U	<1.0 U
ZINC	ug/l	D			<3.0	5.4 B	<4.1 U	6.6 J	4.9 B	<4.8 U	5.9 J	8.2 J
BORON	ug/l	D			411							
SILICA	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	MW-12	MW-12	MW-12	MW-12	MW-21	MW-21	MW-21	MW-21
				Date	9/28/05	12/8/05	3/14/06	6/13/06	3/20/00	7/20/00	11/2/00	3/22/01
				Top (ft)	0	0	0	0				
				Bottom (ft)	0	0	0	0				
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D							<77	<19.0	<19.0	<19.0
ANTIMONY	ug/l	D	6		<6.4 U	<6.4 U	<6.4 U	<9.7 U	<8.4	<9.4	<9.4	<9.4
ARSENIC	ug/l	D	10		*32.9	<9.3 U	9.9 J	*41.5	*1760	*1720	*2000	*2090
BARIUM	ug/l	D	2000		123	56.4	97.8	106	32.2	32.4 J	32.2	32.9
BERYLLIUM	ug/l	D	4									
CADMIUM	ug/l	D	5		<.97 U	<.97 U	<.97 U	<.91 U	*11.2	*12.6	*9.8	*16.1
CALCIUM	ug/l	D							561000	615000	577000	587000
CHROMIUM	ug/l	D	100		<4.8 U	<4.8 U	<4.8 U	<2.3 U	<1.7	<1.6	<1.6	<1.6
COPPER	ug/l	D	1300		<1.8 U	<1.8 U	<1.8 U	<2.2 U	<2.9	<1.9	<1.9	<1.9
IRON	ug/l	D							23200	23400	23000	17500
LEAD	ug/l	D	15		<8.4 U	<8.4 U	<8.4 U	<6.9 U	<7.9	<9.8	<9.8	<9.8
MAGNESIUM	ug/l	D							107000	106000	109000	97600
MANGANESE	ug/l	D							723	713	730	852
MERCURY	ug/l	D	2						<.10	<.048	<.12	<.12
NICKEL	ug/l	D			<5.8 U	<5.8 U	<5.8 U	<5.6 U	22.3	26.7	23.7	33.9
SELENIUM	ug/l	D	50		<9.4 U	<9.4 U	<9.4 U	<9.4 U	<4.4	<3.5	3.7 J	<3.5
SILVER	ug/l	D										
SODIUM	ug/l	D							86700	93500	88800	91200
THALLIUM	ug/l	D	2									
VANADIUM	ug/l	D			<1.0 U	<1.0 U	<1.0 U	<1.5 U	<1.9	1.9 J	1.8 J	<1.5
ZINC	ug/l	D			<5.3 U	5.6 B	<5.3 U	<8.1 U	13600	15100 J	14800 J	20800
BORON	ug/l	D							406	432	443	421
SILICA	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	MW-21	MW-21	MW-21	MW-21	MW-21	MW-21	MW-22	MW-22
				Date	7/16/02	2/27/96	12/15/97	9/17/98	6/11/99	11/8/99	3/20/00	7/20/00
				Top (ft)								
				Bottom (ft)								
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D					<44	<52	<52	<77	<77	<19.0
ANTIMONY	ug/l	D	6				<4.1	<5.3	<5.3	<8.4	<8.4	<9.4
ARSENIC	ug/l	D	10		^2430	^2050	^612	^14	^541	^1500	^299	^224
BARIUM	ug/l	D	2000				23	15.4	22.9	33.8 J	22.9 J	20.4 J
BERYLLIUM	ug/l	D	4									
CADMIUM	ug/l	D	5				^6.8	^162	^52.3	^15.3	<.81	<.90
CALCIUM	ug/l	D				581000	609000	543000	588000	593000	566000	602000
CHROMIUM	ug/l	D	100				<1.3	<1.7	<1.7	3.3 U	<1.7	<1.6
COPPER	ug/l	D	1300				2.3 J	3.3 J	<1.7	<2.9	<2.9	<1.9
IRON	ug/l	D				28300	7780	630	8590	19600	16500	15000
LEAD	ug/l	D	15				<3.4	<6.5	<6.5	<7.9	<7.9	<9.8
MAGNESIUM	ug/l	D				88600	43000	24100	66200	84100	23400	18300
MANGANESE	ug/l	D				936	333	394	445	718	1020	858
MERCURY	ug/l	D	2				.033 J	.043 J	.080 B	<.10 UJ	<.10	<.048
NICKEL	ug/l	D					32.8	52	33.9	24.8	2.9 J	5.5 J
SELENIUM	ug/l	D	50				<3.7	<5.9	<5.9	<4.4	<4.4	<3.5
SILVER	ug/l	D										
SODIUM	ug/l	D				87100	42100	27500	64300	73700	23800	25600
THALLIUM	ug/l	D	2									
VANADIUM	ug/l	D					<1.0	<1.1	<1.1	<1.9	<1.9	1.6 J
ZINC	ug/l	D				19600	17800	22400	16300	13300	2300	3230 J
BORON	ug/l	D					378	294	341	396	252	234
SILICA	ug/l	D				38000						

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	MW-22	MW-22	MW-22	MW-22	MW-22	MW-22	MW-22	MW-22
				Date	11/2/00	3/22/01	7/16/02	2/28/96	12/12/97	9/17/98	6/11/99	11/8/99
				Top (ft)								
				Bottom (ft)								
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D			<19.0	<19.0			<44	<52	<52	<77
ANTIMONY	ug/l	D	6		<9.4	<9.4			<4.1	<5.3	<5.3	<8.4
ARSENIC	ug/l	D	10		*458	*66.4	*656	*993	*392	*23	*16	*900
BARIUM	ug/l	D	2000		20.9	19.9			24.2	19.6	21.6	27.0 J
BERYLLIUM	ug/l	D	4									
CADMIUM	ug/l	D	5		<.90	<.90			<.42	<.63	<.63	<.81
CALCIUM	ug/l	D			574000	582000		550000	568000	591000	565000	580000
CHROMIUM	ug/l	D	100		<1.6	<1.6			<1.3	<1.7	<1.7	3.0 U
COPPER	ug/l	D	1300		<1.9	<1.9			<1.4	5.2	<1.7	<2.9
IRON	ug/l	D			19700	11100		27600	15600	3140	1350	27500
LEAD	ug/l	D	15		<9.8	<9.8			<3.4	<6.5	<6.5	<7.9
MAGNESIUM	ug/l	D			21200	18600		45200	21800	15700	16100	35300
MANGANESE	ug/l	D			1030	756		1130	972	263	299	1350
MERCURY	ug/l	D	2		<.12	<.12			<.023	.050 J	.068 B	<.10 UJ
NICKEL	ug/l	D			2.1 J	6.2			5.5	22	22.3	2.9 U
SELENIUM	ug/l	D	50		<3.5	<3.5			<3.7	<5.9	<5.9	<4.4
SILVER	ug/l	D										
SODIUM	ug/l	D			23300	40900		55000	24700	25800	36900	26600
THALLIUM	ug/l	D	2									
VANADIUM	ug/l	D			<1.5	<1.5			<1.0	<1.1	<1.1	<1.9
ZINC	ug/l	D			1750 J	5760		1500	5000	17800	21600	1790
BORON	ug/l	D			283	236			282	249	236	307
SILICA	ug/l	D						29000				

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	PRB-MW-11	PRB-MW-11	PRB-MW-11	PRB-MW-11	PRB-MW-11	PRB-MW-21	PRB-MW-21	PRB-MW-21
					Date	Date	Date	Date	Date	Date	Date	Date
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	10/2/02	1/23/03	4/22/03	7/22/03	10/23/03	10/2/02	1/23/03	4/22/03
							0	0	0			0
							0	0	0			0
					1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D										
ANTIMONY	ug/l	D	6									
ARSENIC	ug/l	D	10		^52.7	^48.7	^16.2	^19.2	^18.5	^1310	^867	^950
BARIUM	ug/l	D	2000									
BERYLLIUM	ug/l	D	4									
CADMIUM	ug/l	D	5									
CALCIUM	ug/l	D										
CHROMIUM	ug/l	D	100									
COPPER	ug/l	D	1300									
IRON	ug/l	D										
LEAD	ug/l	D	15									
MAGNESIUM	ug/l	D										
MANGANESE	ug/l	D										
MERCURY	ug/l	D	2									
NICKEL	ug/l	D										
SELENIUM	ug/l	D	50									
SILVER	ug/l	D										
SODIUM	ug/l	D										
THALLIUM	ug/l	D	2									
VANADIUM	ug/l	D										
ZINC	ug/l	D										
BORON	ug/l	D										
SILICA	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 2**  
**Groundwater Pool A West**

				Sample ID	PRB-MW-21	PRB-MW-21	PRB-MW-21	PRB-MW-22	PRB-MW-22	PRB-MW-22	PRB-MW-22
				Date	7/22/03	10/23/03	10/23/03	10/2/02	4/22/03	7/22/03	10/23/03
				Top (ft)	0	0	0		0	0	0
		Total (T)/	Screening	Bottom (ft)	0	0	0		0	0	0
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	2	1	1	1	1
ALUMINUM	ug/l	D									
ANTIMONY	ug/l	D	6								
ARSENIC	ug/l	D	10		^1230	^1160	^1120	^324	^141	^1070	^642
BARIUM	ug/l	D	2000								
BERYLLIUM	ug/l	D	4								
CADMIUM	ug/l	D	5								
CALCIUM	ug/l	D									
CHROMIUM	ug/l	D	100								
COPPER	ug/l	D	1300								
IRON	ug/l	D									
LEAD	ug/l	D	15								
MAGNESIUM	ug/l	D									
MANGANESE	ug/l	D									
MERCURY	ug/l	D	2								
NICKEL	ug/l	D									
SELENIUM	ug/l	D	50								
SILVER	ug/l	D									
SODIUM	ug/l	D									
THALLIUM	ug/l	D	2								
VANADIUM	ug/l	D									
ZINC	ug/l	D									
BORON	ug/l	D									
SILICA	ug/l	D									

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 3**  
**Groundwater Pool A West**

				Sample ID	MW-23	MW-23	MW-23	MW-23	MW-23	MW-23	MW-23	MW-23
				Date	3/20/00	7/20/00	11/2/00	3/22/01	11/8/99	11/21/03	3/24/04	7/13/04
				Top (ft)						0	0	0
				Bottom (ft)						0	0	0
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D			<77	21.6 J	44.8 U	<19.0	<77			
ANTIMONY	ug/l	D	6		<8.4	<9.4	<9.4	<9.4	<8.4	<8.5 U	<8.5 U	<9.2 U
ARSENIC	ug/l	D	10		^53	^57.5	^59.2	^47.8	^48	^40.0	^52.9	^52.1
BARIUM	ug/l	D	2000		23.5	21.4 J	19.5	18	29.6 J	18.6	19.6	20.7
CADMIUM	ug/l	D	5		<.81	<.90	<.90	<.90	<.81	<.87 U	<.87 U	<.76 U
CALCIUM	ug/l	D			695000	718000	696000	699000	680000			
CHROMIUM	ug/l	D	100		<1.7	<1.6	<1.6	<1.6	<1.7	<2.2 U	<2.2 U	<2.5 U
COPPER	ug/l	D	1300		<2.9	<1.9	<1.9	<1.9	<2.9	<2.1 U	<2.1 U	<2.7 U
IRON	ug/l	D			25300	27400	27600	25900	23500			
LEAD	ug/l	D	15		<7.9	<9.8	<9.8	<9.8	<7.9	<9.3 U	<9.3 U	<10.0 U
MAGNESIUM	ug/l	D			41500	42800	42500	35000	42300			
MANGANESE	ug/l	D			698	775	745	910	647			
MERCURY	ug/l	D	2		<.10	<.048	<.12	<.12	<.10 UJ			
NICKEL	ug/l	D			2.0 J	2.4 J	2.5 J	<1.9	2.3 U	<3.8 U	<3.8 U	<3.1 U
SELENIUM	ug/l	D	50		<4.4	<3.5	8.4 J	<3.5	<4.4	<4.7 U	10.2	<5.9 U
SODIUM	ug/l	D			35400	36000	36200	29100	33000			
VANADIUM	ug/l	D			<1.9	2.9 J	<1.5	<1.5	<1.9	<1.7 U	<1.7 U	3.2 J
ZINC	ug/l	D			1230	1460 J	1490 J	1800	1160	2530	2390	2370
BORON	ug/l	D			460	460	494	488	443			

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 3**  
**Groundwater Pool A West**

				Sample ID	MW-23	MW-23	MW-23	MW-23	MW-23	MW-23	MW-23	MW-23
				Date	9/22/04	12/15/04	3/29/05	7/12/05	9/28/05	12/8/05	3/14/06	6/13/06
				Top (ft)	0	0	0	0	0	0	0	0
				Bottom (ft)	0	0	0	0	0	0	0	0
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1	1	1	1	1	1
ALUMINUM	ug/l	D										
ANTIMONY	ug/l	D	6		<9.2 U	<9.2 U	<9.2 U	<6.4 U	<6.4 U	<6.4 U	<6.4 U	<9.7 U
ARSENIC	ug/l	D	10		^53.7	^40.3	^41.8	^54.3 J	^61.6	^65.9	^54.2	^42.3
BARIUM	ug/l	D	2000		19.7	16.7	17.5	20.3	22	22.9	20.2	16.8
CADMIUM	ug/l	D	5		1.0 J	<.76 U	<.76 U	<.97 U	<.97 U	<.97 U	<.97 U	<.91 U
CALCIUM	ug/l	D										
CHROMIUM	ug/l	D	100		<2.5 U	<2.5 U	<2.5 U	<4.8 U	<4.8 U	<4.8 U	<4.8 U	<2.3 U
COPPER	ug/l	D	1300		<2.7 U	<2.7 U	<2.7 U	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<2.2 U
IRON	ug/l	D										
LEAD	ug/l	D	15		<10.0 U	<10.0 U	<10.0 U	<8.4 U	<8.4 U	<8.4 U	<8.4 U	<6.9 U
MAGNESIUM	ug/l	D										
MANGANESE	ug/l	D										
MERCURY	ug/l	D	2									
NICKEL	ug/l	D			<3.1 U	<3.1 U	5.3 B	<5.8 U	<5.8 U	<5.8 U	<5.8 U	<5.6 U
SELENIUM	ug/l	D	50		<5.9 U	<5.9 U	<5.9 U	<9.4 U	<9.4 U	<9.4 U	<9.4 U	<9.4 U
SODIUM	ug/l	D										
VANADIUM	ug/l	D			<1.6 U	<1.6 U	<1.6 U	<1.0 U	<1.0 U	1.3 J	<1.0 U	<1.5 U
ZINC	ug/l	D			1920	2810	2700	1750	1940	1770	2160	2110
BORON	ug/l	D										

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 3**  
**Groundwater Pool A West**

				Sample ID	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-25	MW-25
				Date	3/20/00	7/20/00	11/2/00	3/22/01	7/16/02	11/8/99	3/22/00	3/22/00
				Top (ft)								
		Total (T)/	Screening	Bottom (ft)								
Analyte	units	Diss. (D)	Criteria	Duplicate #	1	1	1	1	1	1	1	2
ALUMINUM	ug/l	D			<77	<19.0	<19.0	<19.0		<77	<77	<77
ANTIMONY	ug/l	D	6		<8.4	<9.4	<9.4	<9.4		<8.4	<8.4	<8.4
ARSENIC	ug/l	D	10		^285	^235	^240	^261	^259	^264	^198 J	^256 J
BARIUM	ug/l	D	2000		63.3	66.8 J	68	71.5		67.1 J	89.6	79.9
CADMIUM	ug/l	D	5		<.81	<.90	1.2 J	<.90		<.81	<.81	<.81
CALCIUM	ug/l	D			798000	857000	886000	969000		763000	582000	686000 R
CHROMIUM	ug/l	D	100		<1.7	<1.6	<1.6	<1.6		3.9 U	<1.7	<1.7
COPPER	ug/l	D	1300		<2.9	<1.9	<1.9	2.1 J		<2.9	<2.9	<2.9
IRON	ug/l	D			43400	47500	49000	50100		37200	82000 J	109000 J
LEAD	ug/l	D	15		<7.9	<9.8	<9.8	<9.8		<7.9	<7.9	<7.9
MAGNESIUM	ug/l	D			71000	75000	77000	69800		67100	57400 J	82900 J
MANGANESE	ug/l	D			682	689	703	698		732	1990 J	2770 J
MERCURY	ug/l	D	2		<.10	<.048	<.12	<.12		<.10 UJ	<.10	<.10
NICKEL	ug/l	D			<1.6	<1.9	<1.9	<1.9		5.0 U	<1.6	<1.6
SELENIUM	ug/l	D	50		<4.4	<3.5	<3.5	<3.5		<4.4	<4.4	<4.4
SODIUM	ug/l	D			411000	449000	524000	613000		374000	1240000	1170000
VANADIUM	ug/l	D			<1.9	4.4	2.5 J	<1.5		1.9 U	2.2 J	2.0 J
ZINC	ug/l	D			608	114 J	65.5 J	128 J		2890	39 U	51 U
BORON	ug/l	D			255	262	288	283		234	510 J	638 J

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 3**  
**Groundwater Pool A West**

				Sample ID	MW-25	MW-25	MW-25	MW-25	MW-25	MW-25	MW-25	MW-25
				Date	7/21/00	7/21/00	11/2/00	11/2/00	3/23/01	3/23/01	7/16/02	11/9/99
				Top (ft)								
				Bottom (ft)								
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	2	1	2	1	2	1	1
ALUMINUM	ug/l	D			21.5 J	21.2 J	<19.0	<19.0	37.4 U	39.6 U		<77
ANTIMONY	ug/l	D	6		<9.4	<9.4	<9.4	<9.4	<9.4	<9.4		<8.4
ARSENIC	ug/l	D	10		^178	^167	^163	^160	^151 J	^187 J	^111	^196
BARIUM	ug/l	D	2000		94.6 J	98.2 J	93.4	96.3	100	93.1		97.4 J
CADMIUM	ug/l	D	5		<.90	<.90	2.3 J	2.2 J	<.64	<.64		1.40 J
CALCIUM	ug/l	D			671000	654000	661000	642000	693000	745000		609000
CHROMIUM	ug/l	D	100		1.8 J	<1.6	<1.6	<1.6	<1.6	<1.6		2.3 U
COPPER	ug/l	D	1300		3.3 J	<1.9	<1.9	<1.9	<1.9	<1.9		<2.9
IRON	ug/l	D			95900	90800	84900	84800	71000	84600		85000
LEAD	ug/l	D	15		<9.8	<9.8	<9.8	<9.8	<9.8	<9.8		<7.9
MAGNESIUM	ug/l	D			72200	67200	49500	49000	53400 J	66200 J		60700
MANGANESE	ug/l	D			2310	2150	1950	1930	1540 J	1860 J		2240
MERCURY	ug/l	D	2		<.048	<.048	<.12	<.12	<.12	<.12		<.10 UJ
NICKEL	ug/l	D			3.1 J	<1.9	<1.9	<1.9	<1.9	<1.9		<1.6
SELENIUM	ug/l	D	50		5.4 J	7.0 J	<3.5	4.1 J	<3.5	<3.5		<4.4
SODIUM	ug/l	D			1170000	1170000	1200000	1250000	1170000	1220000		1280000
VANADIUM	ug/l	D			11.3	11.5	6.1	6.5	1.6 J	<1.5		3.2 U
ZINC	ug/l	D			67.7 J	59.8 J	49.6 J	54.8 J	41.9	22.4		128
BORON	ug/l	D			567	532	575	577	709	839 J		498

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 3**  
**Groundwater Pool A West**

				Sample ID	MW-25	PRB-MW-24	PRB-MW-24	PRB-MW-24	PRB-MW-24	PRB-MW-24	PRB-MW-24	PRB-MW-25	PRB-MW-25
				Date	11/9/99	10/1/02	1/23/03	4/22/03	7/22/03	10/22/03	10/1/02	1/23/03	
				Top (ft)				0	0	0			
				Bottom (ft)				0	0	0			
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	2	1	1	1	1	1	1	1	
ALUMINUM	ug/l	D			<77								
ANTIMONY	ug/l	D	6		<8.4								
ARSENIC	ug/l	D	10		^213	^254	^263	^283	^284	^276	^138	^173	
BARIUM	ug/l	D	2000		93.5 J								
CADMIUM	ug/l	D	5		1.22 J								
CALCIUM	ug/l	D			627000								
CHROMIUM	ug/l	D	100		2.3 U								
COPPER	ug/l	D	1300		<2.9								
IRON	ug/l	D			92500								
LEAD	ug/l	D	15		<7.9								
MAGNESIUM	ug/l	D			67200								
MANGANESE	ug/l	D			2460								
MERCURY	ug/l	D	2		<.10 UJ								
NICKEL	ug/l	D			2.9 U								
SELENIUM	ug/l	D	50		<4.4								
SODIUM	ug/l	D			1260000								
VANADIUM	ug/l	D			2.7 U								
ZINC	ug/l	D			106								
BORON	ug/l	D			547								

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**Table 3**  
**Groundwater Pool A West**

				Sample ID	PRB-MW-25	PRB-MW-25	PRB-MW-25
				Date	4/22/03	7/23/03	10/22/03
				Top (ft)	0	0	0
				Bottom (ft)	0	0	0
Analyte	units	Total (T)/ Diss. (D)	Screening Criteria	Duplicate #	1	1	1
ALUMINUM	ug/l	D					
ANTIMONY	ug/l	D	6				
ARSENIC	ug/l	D	10		^170	^165	^165
BARIUM	ug/l	D	2000				
CADMIUM	ug/l	D	5				
CALCIUM	ug/l	D					
CHROMIUM	ug/l	D	100				
COPPER	ug/l	D	1300				
IRON	ug/l	D					
LEAD	ug/l	D	15				
MAGNESIUM	ug/l	D					
MANGANESE	ug/l	D					
MERCURY	ug/l	D	2				
NICKEL	ug/l	D					
SELENIUM	ug/l	D	50				
SODIUM	ug/l	D					
VANADIUM	ug/l	D					
ZINC	ug/l	D					
BORON	ug/l	D					

Criteria = Federal Maximum Contamination Levels 10/10/01

\* and shaded cells = Concentration above criteria (NDs [\*\*] assumed to be 50% reporting limit)

< and ND = Non detect at stated reporting limit

**APPENDIX F**  
**COST ESTIMATES**

Appendix F  
Cost Estimate  
East Chicago Site  
East Chicago, Indiana

**Cost Comparison For Various Alternatives**

Media		Soil					Groundwater		Total (MM/30yr)*
Alternative	Description	IAC	Soil Or Gravel Cover	Asphalt Cover	Excavation & Off-site Disposal*	In-Situ Stabilization**	PRB	Monitoring and IC	
Alt-1	Institutional Controls For Soil and Groundwater	—						\$ 54,000.00	\$0.43
Alt-2	Gravel Cover (1-ft); Permeable Reactive Barrier; and Institutional Controls	—	\$2,765,000 (SC) to \$3,837,000 (GC)				\$ 1,766,000.00	\$ 94,000.00	\$5.3 (SC) to 6.36 (GC)
Alt-3	Asphalt Cover; Permeable Reactive Barrier; and Institutional Controls	—		\$ 6,311,000.00			\$ 1,766,000.00	\$ 94,000.00	\$8.83
Alt-4	Excavation and Off-site Disposal (Top 2-ft), Permeable Reactive Barrier, and Institutional Controls For Groundwater	—			\$ 21,453,000.00		\$ 1,766,000.00	\$ 94,000.00	\$23.98
Alt-5	In-situ Stabilization (Top 2-ft) and Institutional Controls	—				\$ 8,506,000.00	\$ 1,766,000.00	\$ 94,000.00	\$9.26
Alt-6	Institutional Controls and Permeable Reactive Barrier	—					\$ 1,766,000.00	\$ 94,000.00	\$2.52

**Notes:**

1. Detailed description of alternatives are presented in the text and in the Assumptions on Page 2
2. \*Assume a project life of 30 years and ased on an interest rate of 12%
3. Based on groundwater COPC delineation, a 3,000-ft PRB will be sufficient to prevent off-site migration.
4. Monitoring wells and PRB wells will be sampled semi-annually.
5. Installation of a new PRB will also require installation of 20 additional wells to monitor the effectiveness of the new PRB.
6. The monitoring wells that are presently sampled will continue to be sampled on a semi-annual basis.
7. Existing wells are: MW-2, 3, 4, 5, 6, 9, 10, 12, 13, 15, 18, 20,21, 22, 23, 26, 27, 28
8. Alternative-3 also includes backfilling and assuming 100% of the soil is hazardous waste.

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Cost Estimate  
East Chicago Site  
East Chicago, Indiana

**Alternative-2: Soil Cover (2-ft Thick)**

Work Item	Units	Estimated Quantity	Unit Price	Extended Cost
Mobilization/Demobilization	LS	1	---	\$ 88,503.88
Site preparation and clearing	Acre	16.79	\$ 500.00	\$ 8,395.00
Access road	LS	1	\$ 10,000.00	\$ 10,000.00
Clean unclassified fill, 6-inch lifts, from off-site source, delivery, spreading, and compaction	Ton	81,264	\$ 15.00	\$ 1,218,954.00
Grading	CY	54,176	\$ 5.00	\$ 270,878.67
Top soil (6-inch thickness)	Acre	17	\$ 15,000.00	\$ 251,850.00
Sediment and erosion control	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>				<b>\$ 1,858,582</b>
Contingency (10% scope and 15% bid)	%	---	25	\$ 464,645
<b>Subtotal</b>				<b>\$ 2,323,227</b>
Design (8% of total cost)	%	---	8	\$ 185,858
Project Management (5% of total cost)	%	---	5	\$ 116,161
Construction Management (6% of total cost)	%	---	6	\$ 139,394
<b>Total Cost Of Alternative</b>				<b>\$ 2,765,000</b>
<b>Cost/acre</b>				<b>\$ 164,681</b>

**Assumptions:**

1. Soil density = 1.5 tons/CY
2. 2-ft thick soil cover over the entire site (35 acres).
3. Soil for the cap will be from off-site locations.
4. No top soil is assumed since some form of soil stabilization will be used.
5. The main purpose of the soil cover is to prevent exposure to construction workers and to future residents.
6. No removal of existing construction/industrial debris.

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Cost Estimate  
East Chicago Site  
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**Alternative-2: Aggregate Cover (1-ft Thick)**

Work Item	Units	Estimated Quantity	Unit Price	Extended Cost
Mobilization/Demobilization	LS	1	---	\$ 122,815.15
Site preparation and clearing	Acre	16.79	\$ 500.00	\$ 8,395.00
12-inch graded aggregate base course, delivery and spreading.	Ton	54,176	\$ 45.00	\$ 2,437,908.00
Sediment and erosion control	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>				<b>\$ 2,579,118</b>
Contingency (10% scope and 15% bid)	%	---	25	\$ 644,780
<b>Subtotal</b>				<b>\$ 3,223,898</b>
Design (8% of total cost)	%	---	8	\$ 257,912
Project Management (5% of total cost)	%	---	5	\$ 161,195
Construction Management (6% of total cost)	%	---	6	\$ 193,434
<b>Total Cost Of Alternative</b>				<b>\$ 3,837,000</b>
			Cost/acre	\$ 228,528.89

**Assumptions:**

1. A standard commercial driveway and parking lot would be the minimum required based on INDOT regulations, which would include a cross-section that consists of an 8-inch graded aggregate base course, a 3-inch hot-mix bituminous concrete binding course, a
2. Assume graded aggregate base course cost of 2 tons/CY.
3. Assume bituminous concrete binding course of 2.05 tons/CY.

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Cost Estimate  
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**Alternative-3: Asphalt Cover**

Work Item	Units	Estimated Quantity	Unit Price	Extended Cost
Mobilization/Demobilization	LS	1	---	\$ 202,030.23
Site preparation and clearing	Acre	16.79	\$ 500.00	\$ 8,395.00
8-inch graded aggregate base course, delivery and spreading.	Ton	36,298	\$ 45.00	\$ 1,633,398.36
3-inch hot mix bituminous concrete binding course.	Ton	13,883	\$ 55.00	\$ 763,539.24
2-inch bituminous concrete wearing course.	SY	81,264	\$ 20.00	\$ 1,625,272.00
Sediment and erosion control	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>				<b>\$ 4,242,635</b>
Contingency (10% scope and 15% bid)	%	---	25	\$ 1,060,659
<b>Subtotal</b>				<b>\$ 5,303,294</b>
Design (8% of total cost)	%	---	8	\$ 424,263
Project Management (5% of total cost)	%	---	5	\$ 265,165
Construction Management (6% of total cost)	%	---	6	\$ 318,198
<b>Total Cost Of Alternative</b>				<b>\$ 6,311,000</b>
			Cost/acre	\$ 375,878.50

**Assumptions:**

1. A standard commercial driveway and parking lot would be the minimum required based on INDOT regulations, which would include a cross-section that consists of an 8-inch graded aggregate base course, a 3-inch hot-mix bituminous concrete binding course, and a 2-inch bituminous concrete wearing course.
2. Assume graded aggregate base course cost of 2 tons/CY.
3. Assume bituminous concrete binding course of 2.05 tons/CY.

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Cost Estimate  
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**Alternative 4: Excavation (Top 2-ft), Off-site Disposal, and Backfill**

Work Item	Units	Estimated Quantity	Unit Price	Extended Cost
Mobilization/Demobilization	LS	1	---	\$ 686,742.78
Site preparation and clearing	Acre	16.79	\$ 500.00	\$ 8,395.00
Access road	LS	1	\$ 10,000.00	\$ 10,000.00
Soil excavation	CY	54176	\$ 5.00	\$ 270,878.67
Transportation and disposal of soils as hazardous	Ton	81,264	\$ 147.00	\$ 11,945,749.20
Clean unclassified fill, 6-inch lifts, from off-site source, delivery, spreading, and compaction	Ton	81,264	\$ 15.00	\$ 1,218,954.00
Grading	CY	54,176	\$ 5.00	\$ 270,878.67
Sediment and erosion control	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>				<b>\$ 14,421,598</b>
Contingency (10% scope and 15% bid)	%	---	25	\$ 3,605,400
<b>Subtotal</b>				<b>\$ 18,026,998</b>
Design (8% of total cost)	%	---	8	\$ 1,442,160
Project Management (5% of total cost)	%	---	5	\$ 901,350
Construction Management (6% of total cost)	%	---	6	\$ 1,081,620
<b>Total Cost Of Alternative</b>				<b>\$ 21,453,000</b>

Cost/acre for 2-ft \$ 1,277,724.84

**Assumptions:**

1. Soil density = 1.5 tons/CY
2. Alternative-3 involves excavation and disposal of impacted soils Top 2-ft.  
This alternative also includes backfilling and assuming 100% of the soil is hazardous waste.

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Cost Estimate  
East Chicago Site  
East Chicago, Indiana

**Alternative 5: In-Situ Stabilization**

Work Item	Units	Estimated Quantity	Unit Price	Extended Cost
Mobilization/Demobilization	LS	1	---	\$ 272,298.42
Site preparation and clearing	Acre	16.79	\$ 500.00	\$ 8,395.00
Access road	LS	1	\$ 10,000.00	\$ 10,000.00
Stabilization with Enviroblend	CY	54,176	\$100	\$ 5,417,573.33
Sediment and erosion control	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>				<b>\$ 5,718,267</b>
Contingency (10% scope and 15% bid)	%	---	25	\$ 1,429,567
<b>Subtotal</b>				<b>\$ 7,147,833</b>
Design (8% of total cost)	%	---	8	\$ 571,827
Project Management (5% of total cost)	%	---	5	\$ 357,392
Construction Management (6% of total cost)	%	---	6	\$ 428,870
<b>Total Cost Of Alternative</b>				<b>\$ 8,506,000</b>

Cost/acre for 2-ft

506,611.08

**Assumptions:**

1. Stabilization with enviroblend or cement

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Cost Estimate  
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**New Permeable Reactive Barrier Installation**

Work Item	Estimated Quantity	Units	Unit Price	Extended Cost
Mobilization/Demobilization to and from site including transportation and supply of equipment, Clear and Grub, Grade, Install, Provide and Maintain Construction Access, Construct/Remove Temporary Tracking/Decontamination Pad/Groundwater Recharge Basin, Containerize/Load Decontamination Water. Install/maintain/Remove Groundwater Management Controls. Use PPE as directed, PPE Storage and Disposal, Equipment. Staging Area, Provide Site Trailers, Install/Maintain Utility Connections and other supplies, and Ancillary Equipment, associated with the Work Activities per specifications.	LS	1	\$ 100,000.00	\$ 100,000.00
Install, Maintain and Remove Temporary Silt Fencing and Soil Erosion and Sediment Control Measures	LS	1	\$ 13,333.33	\$ 13,333.33
Install 4 Feet High Visible Safety Fencing as a safety measure to restrict free access to the location of the PRB and/or other portions of Work Area during the Construction Activities	LS	1	\$13,333.33	\$ 13,333.33
Install PRB to grade, Includes handling of all excavated hazardous and non-hazardous material within Work Area and other Areas on Site in accordance with all Applicable Federal, State and Local Rules and Regulations (3000 ft x 40 ft)	SF	120,000	\$ 8.00	\$ 960,000.00
Installation of 20 new monitoring wells to monitor effectiveness of new PRB	Well	20	\$ 5,000.00	\$ 100,000.00
<b>Subtotal</b>				<b>\$ 1,186,666.67</b>
Contingency (10% scope and 15% bid)	%	---	25	\$ 296,666.67
<b>Subtotal</b>				<b>\$ 1,483,333.33</b>
Design (8% of total cost)	%	---	8	\$ 118,666.67
Project Management (5% of total cost)	%	---	5	\$ 74,166.67
Construction Management (6% of total cost)	%	---	6	\$ 89,000.00
<b>Total for 3,000 ft of PRB</b>				<b>\$ 1,766,000.00</b>

Note: Costs obtained from previous East Chicago PRB construction costs bid-sheet.

1. Assume installation of 20 additional wells (unit cost from Phillip Chen, \$5,000/well)

Appendix F  
Cost Estimate  
East Chicago Site  
East Chicago, Indiana

Work Item	Units	Unit Price
Mobilization/Demobilization	LS	5% of con-struction cost
Site preparation and clearing	Acre	\$ 500.00
Soil excavation	CY	\$ 5.00
Transportation and disposal of soils as non-hazardous	Ton	\$ 47.00
Transportation and disposal of soils as hazardous	Ton	\$ 147.00
Clean unclassified fill, 6-inch lifts, from off-site source, delivery, spreading, and compaction	Ton	\$ 15.00
Grading	CY	\$ 5.00
Top soil (6-inch thickness)	Acre	\$ 15,000.00
Sediment and erosion control	LS	\$ 30,000.00
Stabilization with Enviroblend	CY	\$100
Monitoring Well O&M (27 existing wells)	LS	\$ 54,000.00
Additional Monitoring Well O&M (20 new MWs)	LS	\$ 40,000.00
Installation of new monitroing wells	Well	\$ 5,000.00
Contingency (10% scope and 15% bid)	%	25
Design (8% of total cost)	%	8
Project Management (5% of total cost)	%	5
Construction Management (6% of total cost)	%	6